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VOLUME XIV JULY 27, 1925 NUMBER 12

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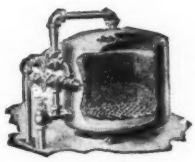

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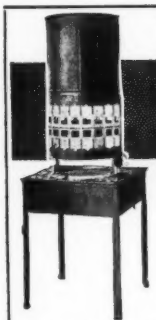

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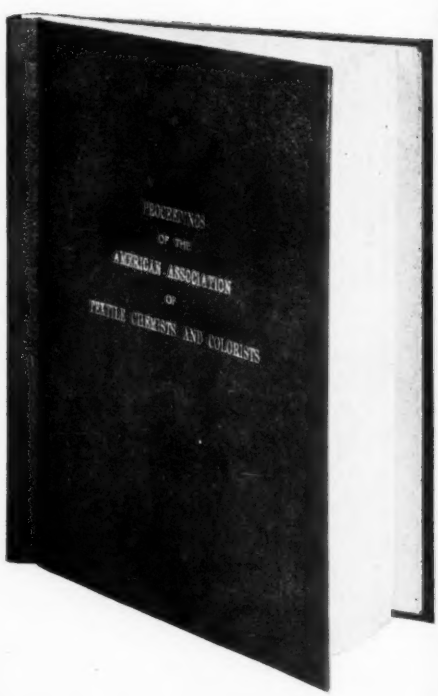

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VOLUME XIV NEW YORK, JULY 27, 1925 NUMBER 12

Note on the Identification of Phosphotungstic-Basic Dye Lakes

One Hundred and Eighth Contribution from the Color Laboratory, Bureau of Chemistry, Washington, D. C.

By WALTER C. HOLMES

Associate Chemist, Color Laboratory, Bureau of Chemistry

THE phosphotungstic lakes of basic dyes are of considerable importance in the tinting of paper.[1] The products supplied to the paper trade contain dextrin but no inorganic base, or carrier. Their introduction is of comparatively recent date, and no methods of analysis have hitherto been made available.

Both the chemical constitution and the essential physical properties of the lakes prepared from any given dye may vary appreciably with variations in manufacturing practice. Chemical analysis is useless as an index of practical utility and the complete analysis of the products would seldom be undertaken. The characteristics of the lakes, however, are primarily dependent upon the selection of the dyes employed in their preparation, and the analyst may be called upon to establish the identity of the dye or dyes present in samples of unknown character.

No satisfactory means has been found for the recognition of individual dye-lakes, as such, but the resort to acid attack proves effective. The lakes are stable to low acidities but disintegrate under the action of strong acids, yielding solutions from which the component dyes may be recovered in normal form. Spectrophotometric methods of examination then afford a very convenient means for the decisive identification of the dye, or dyes, present, and for the determination of the relative proportions of the component dyes if more than one dye has beeen employed.

The solvents employed are glacial acid and concentrated hydrochloric and sulphuric acids. With acetic acid no alteration in the dye need be feared, even upon prolonged boiling, and the resulting solutions are suitable for direct spectrophotometric examination. On the other hand, the hydrogen ion concentration is too low, and the acid attack too mild, to render acetic acid an ideal reagent for the purpose in view. Most technical lake products contain the lakes of two (or more) dyes, which usually differ in respect to their susceptibility to acid attack. With such products the dye solutions obtained with acetic acid cannot be relied upon to afford a reliable index to the relative proportions of the dyes in the sample, and the presence of a dye component may even escape detection. It is advisable to supplement the examination of the acetic acid extract with an examination of material obtained by resorting to the use of a mineral acid and to place chief dependence for making quantitative conclusions upon the latter examination.

With the great majority of lakes either hydrochloric or sulphuric acid, or both, may be employed without danger of essential alteration in the dyes. The solutions of the basic dyes in strong acids are not usually suitable for direct examination. After solution has been effected the acid is almost completely neutralized by the cautious addition of strong alkali. In the processs of neutralization the coloring matter reverts to the normal dye and is salted out, leaving the solution, which should not have been increased in volume very greatly, practically free from color. The precipitated dye and excess salt are filtered off and freed from any considerable amount of water, and the dye is leached out with alcohol. The resulting alcoholic solution is then examined in the spectrophotometer, with such further dilution with alcohol as may be required.

The absorption maxima of most basic dyes in both concentrated acetic acid and in alcohol are recorded in the tables of Formanek and Grandmougin.[2] The positive identification of the dyes present and the determination of their relative proportions may usually be made readily by the standard spectroscopic and spectrophotometric

[1] Holmes, Color Trade Journal, Nov., 1922.

[2] Untersuchung und Nachweis organischer Farbstoffe auf Spektroskopischen Wege, Part II, Berlin, 1911, 1913.

methods. In some instances, however, it may be necessary to effect a partial separation of dyes in order to identify components, particularly if one component is present in relatively very small proportions.

If the spectrophotometer is not available, it may often prove possible to obtain information of value regarding the dyes employed in the manufacture of lake products by a very simple means. The colors of solutions of basic dyes in strong mineral acids and the color changes produced by the dilution of those solutions are often very characteristic. The color reactions of many phosphotungstic lakes of basic dyes in acids have been observed and found without exception to conform very closely with those of the dyes from which they were prepared. Accordingly, these reactions, which are recorded in numerous reference works, may be employed with the lakes themselves and may often throw much light on the probable identity of the dye if only one dye is present or if the secondary component of a dye-lake mixture is present in relatively small proportions.

The characteristic color changes resulting from the dilution of solutions of basic dyes in strong mineral acids are usually indicative of transitions in the dyes from tri- or di-acidic salts to mon-acidic salts (the normal dyes), which are dependent upon the changes in hydrogen ion concentration. Indecisive or misleading results are sometimes obtained by the inexperienced analyst through a failure to insure the solution of enough dye. Under those circumstances the dye concentration may become too small for favorable color observation before the acidity of the solution becomes sufficiently reduced to complete the transitions in question. In the application of the reactions to the phosphotungstic lakes the relatively refractory character of the products renders it the more necessary to observe precaution in this particular. It may be noted, however, that the color changes of relatively weak solutions of dyes in acids may be observed successfully by combining neutralization with dilution in such manner as to reduce materially the dilution necessary to attain the ultimate low degree of acidity required.

Dyeing Acetate Silk

Part X

(*Continued from page* 466)

The Ionamines—Structure, Characteristics, Classes and Methods of Dyeing—Fastness Properties—Patent Abstracts

By CHAS. E. MULLIN, M. Sc., F. A. I. C.

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THE fact that many substances insoluble in water dye acetate silk, and that the usual method of solubilizing dyestuffs—that is, by sulphonating—usually destroys the affinity of the product for acetate silk, led to research for a new method of solubilizing the insoluble bases, dyes, etc., without reducing their affinity for the acetate silk. Several methods of solubilizing without introducing the sulphonic group have been mentioned, such as the introduction of the carboxyl group, etc., but the Ionamines are new products, applied by an entirely new method. They were developed to meet the exacting requirements of the acetate silk dyeing industry, and are to-day one of the most important groups of dyes for this purpose.

According to Green and Saunders, various dyeing experiments on acetate silk led to the theory that dyestuffs containing hydroxyalkyl radicles attached to nitrogen might have an affinity for acetate silk by virtue of their alcoholic groups. However, the azo compounds of this type prepared, which included dihydroxyethyldiaminoazobenzene, nitrobenzeneazodihydroxyethylaniline and benzeneazobisdihydroxypropylaniline, were not highly successful. While the simpler bases which were soluble in water had an affinity for acetate silk, the affinity decreased as the number of alcoholic groups increased, thus disproving the hypothesis.

It was then concluded that the dyeing of acetate silk was mainly a solution problem conditioned by the following factors: (1) The dye should contain amino, substituted amino, or hydroxyl groups and strong salt-forming groups, such as the sulphonic group, should be absent, for if present they greatly reduced or obviate the dyeing affinity; (2) when basic compounds are used as their salts with acids, such as dyestuff-hydrochlorides, the salt should be readily dissociated by water, as it is the base and not the salt which is absorbed by the fiber; (3) the free base should be at least sparingly soluble in water; (4) as high molecular complexity tends to diminish solubility in non-aqueous solvents, such as fiber, the molecule should not be too large. By the application of these rules (which in most respects parallel very closely those on which the SRA dyes were developed, as well as Clavell's theory), after considerable research compounds were produced which were more or less soluble in water, and which hydrolyzed in solution as desired, giving the sparingly solu-

ble base of not too complex form to be absorbed by the acetate silk.

The actual products employed were the omega-sulphonic acids of amino compounds of the general formula $X.NR'.CHR''.SO_3H$, in which X is a hydrocarbon nucleus and R′ and R″ are alkyl groups or hydrogen. While such compounds were not new, they had not previously been used commercially as dyes. The simpler compounds of this class, which are colorless, are formed by treating primary or secondary amines with aldehyde bisulphites, such as formaldehyde bisulphite, or formaldehyde and sodium bisulphite. These omega-sulphonic acid compounds have the desired property of readily hydrolyzing on heating in the presence of dilute acids or alkalies, giving the corresponding amine or amino compound and the aldehyde bisulphite or its decomposition products as follows: $X.NH.CH_2.SO_3NA + HCl + H_2O = X.NH_2.HCl + HCOH + NaHSO_3$. While the base is nearly insoluble in water, it is soluble in acetate silk and has a high affinity for it. The hydrolysis is due to the fact that the sulphonic group is situated externally to the nucleus of the dye proper.

Such azo dyes, depending entirely upon the omega-sulphonic acid groups for solubility, behave in general like acid dyes and the free aminoazo base dyes acetate silk, especially in a slightly acid or alkaline bath. This free base can in certain cases be diazotized and coupled with phenols or amines on the fiber. The products derived from primary amino compounds contain free amino groups and may be diazotized and developed, giving a wide range of fast colors. The products derived from secondary amino compounds may be used for direct shades, but are not diazotizable. These omega-sulphonic acid products are called Ionamines, and are applied in slightly acid or alkaline dye baths at about 65 to 75 deg. Cent. (140 to 167 deg. Fahr). They have a good affinity for acetate silk and exhaust well even in dilute baths without the addition of salt. In the presence of sufficient acid they level well if the temperature of the bath is not increased too rapidly. The dye bath should be about twenty to one hundred times the weight of the material. In dyeing cord or fabrics which require deep penetration, it is best to work the material well in a neutral dye bath and then acidify the bath gradually during the dyeing.

The Ionamines that have the greatest affinity for acetate silk have the least affinity for cotton, and those that have the greatest affinity for cotton have the least for acetate silk. The other artificial silks react to the Ionamines in the same manner as cotton. Wool is dyed by the unhydrolyzed dye in an acid bath, but not by the free base after hydrolization. In the case of silk, the dyeing appears to be explained only on the solution theory.

The first Ionamines were divided into two classes: those containing one salt-forming group within the molecule, such as Ionamine B, and those containing two salt-forming groups, such as Ionamine A. The later nomenclature adapted for the Ionamines uses distinguishing letters only to denote those intended for developing colors, while the direct dyeing Ionamines are denoted by the color produced. The Ionamines containing only one salt-forming group have greater stability to hydrolysis, and when dyed are not greatly affected by organic acids. Those containing the salt-forming groups are more easily hydrolyzed, and may be applied with formic or acetic acid, sodium carbonate, sodium acetate or in a neutral bath. When dyed the shade is easily affected by dilute organic acids, but when diazotized and developed they are fast and give deep shades.

In diazotizing and developing Ionamines containing two free amine groups, care must be taken to insure complete tetrazotization and coupling, or the color will not be fast. Only the unsulphonated phenols are useful in developing, and *B*-naphthol, resorcinol or *B*-hydroxynaphthoic acid is particularly recommended. Various combinations of these with the different Ionamines give a wide range of colors, very fast to washing, light, perspiration, rubbing, etc. Metaphenylenediamine and ethyl-*B*-naphthylamine are also mentioned as developers, but are not very satisfactory. Interesting two-color effects are obtained on cotton-acetate silk union dyed either in one bath or by cross-dyeing. In dyeing wool-acetate silk unions it must be remembered that the unhydrolyzed dye acts as an acid dye on the wool, and this must be taken into account. Natural silk is partly dyed by the hydrolyzed and partly by the unhydrolyzed dye. All this points to a wider use for the Ionamines than on acetate silk alone, owing to their combined acid and basic properties.

The colors available vary from yellow and orange to scarlet, red, maroon, violet, blue and black. However, there do not as yet appear to be any brown or direct black Ionamines. Cellutyl Union Black R is a mixture of a direct cotton black and an Ionamine in such proportions as to give a uniform black on cotton-acetate silk unions upon developing with *B*-hydroxynaphthoic acid. Recently special attention has been paid to the development of new Ionamines containing only one salt-forming group, similar to the original Ionamine B, as these dyes are of satisfactory fastness when dyed direct without diazotizing and developing. It was particularly difficult to find a fast blue, as the aminoazo, disazo and induline compounds tried were unsatisfactory. While the omega-sulphonic acid compounds of the gallocyanine combined with paradiamine gave reddish blue to violet shades in neutral baths, they were not fast to light. The Ionamine Blue R and G eventually produced are the omega-sulphonates of unsulphonated aminoanthraquinones and have excellent light fastness. (See British Patent No. 211,720.) These dye in the same manner as the other members of the group, but do not exhaust as completely.

In practical dyeing, some difficulties were experi-

enced in obtaining thorough penetration with Ionamines containing a very insoluble base, such as Ionamine A, but this was overcome by entering the material at about 30 deg. Cent. (86 deg. Fahr.) in a dye bath containing 3 to 5 per cent of mineral acid and increasing the temperature very slowly to about 75 deg. Cent. (167 deg. Fahr.) and dyeing for about one-half hour or longer. In this manner the hydrolysis of the dye is retarded, allowing it to penetrate the material. As before stated, the Ionamines may be either primary or secondary, according to whether the amino group carrying the alkyl omega-sulphonic acid group is primary or secondary. Usually the secondary Ionamines have better penetrating qualities than the primary, and are therefore more level dyeing. The two groups can readily be differentiated by the action of nitrous acid, which decolorizes the primary Ionamines without forming a coupling diazo compound.

When applied to acetate silk, many dyes appear to be subjected to "phototropy," as this fault was common to many of the dyes tried in this research as well as in the work on the SRA dyes. Phototropy is the property of changing color under certain lighting conditions; i. e., if the dyed acetate silk is shielded from the light for a few minutes, on removing the shield the color is lighter beneath, but darkens in a short time until it matches the surroundings.

The advantages in using the Ionamines would appear to be their solubility in water and the fact that they are not precipitated by acids, alkalies or salt, and under suitable conditions can be applied in the same dye bath with the cotton colors. One of the main difficulties which may arise in their practical application is the matter of obtaining a wide range of dyes that will hydrolyze, within reasonable limits, at approximately the same rate under similar conditions in the dye bath, as regards acidity or alkalinity and temperature. This may become a matter of considerable importance in large-scale dyeing of the various innumerable mixtures required for all shades.

It is also stated that under certain conditions of applying the developed Ionamines the silk may lose its luster or go "blind," possibly due to the formation of crystalline compounds on or near the surface of the fiber. In fact, it is claimed that such a crystalline formation can be seen with the microscope under certain conditions. Such blindness may also occur with other developed colors on acetate silk, and is not confined to the Ionamines alone. In general, the Ionamines have a greater affinity for Celanese than for Lustron, and therefore when applied in the same bath the Celanese is usually somewhat darker than the Lustron. However, the Ionamines, as well as the other developed colors, may be used on Lustron just as well as on Celanese with the same fastness properties. As the actual coloring matter is usually largely produced within the fiber, the dye bath is generally clear throughout the dyeing operation, the color penetrating well and remaining firmly fixed in the fiber.

Method No. 74: Dyeing Acetate Silk with Ionamine A.—Ionamine A is used mainly for black with *B*-hydroxynaphthoic acid, but may also be used as a direct yellow. Its various fastness properties are given in Table X. This dye is not as soluble as most of the Ionamines, but the presence of a certain amount of insoluble dye does not interfere with either its leveling or penetrating properties, and it exhausts well from the dye bath. The acetate silk scoured by Method No. 5, without the souring, is entered into the lukewarm dyebath containing the dye and 1 per cent of formic acid. In one-half hour the temperature of the bath is raised to 75 deg. Cent. (167 deg. Fahr.) and held there for three-quarters to one hour, when the bath should be exhausted. In place of the formic acid, 2 per cent of soda ash, ¼ per cent of sulphuric or ½ per cent of hydrochloric acid may be used in the dye bath, but salt or sodium sulphate is of no advantage. If the shade is not to be developed, the goods may pass through an alkaline bath containing a little ammonia or soda ash.

Method No. 74A: If the shade is to be diazotized, it is rinsed without neutralizing the acid and diazotized in a bath containing 5 per cent of sodium nitrite and 10 to 15 per cent of 32 deg. Tw. hydrochloric acid for medium shades for twenty minutes. It is then rinsed and entered into a cold developing bath containing 3 to 6 per cent of developer and the temperature raised to 50 to 60 deg. Cent. (122 to 140 deg. Fahr.) for about one-half hour. The condition of the silk may be improved by rinsing well and soaping for twenty minutes at 50 deg. Cent. (120 deg. Fahr.) in a bath containing 2 pounds of soap per 100 gallons of water.

Method No. 75: Ionamine H.—Ionamine H is used both as a direct shade for a yellowish green or with *B*-naphthol for bluish red. It may also be developed with resorcinol or *B*-hydroxynaphthoic acid. In the latter case a blue-violet is obtained which is sensitive to both alkalies and acids. It has good penetration. The dye is soluble in hot water and is applied in the same manner as in Method No. 74 for Ionamine A, except that 2 per cent formic acid is used, or 1 per cent of sodium carbonate may be substituted for the acid. One-half per cent of sulphuric or 1 per cent of hydrochloric acid may also be used in place of the formic acid. It is diazotized in the same manner as in Method No. 74A.

Method No. 75A: When *B*-naphthol is used as developer, it is applied in a bath containing 6 per cent of developer and is prepared by dissolving the *B*-naphthol in the minimum amount of caustic soda solution, which is usually about an equal weight of the 76 deg. Tw. solution, and this is diluted for use. The developing bath is used cold. The acetate silk may then be treated

(*Continued on page* 510)

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

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JUNE MEETING OF RHODE ISLAND AND NORTHERN NEW ENGLAND SECTIONS

The Rhode Island and Northern New England Sections of the American Association of Textile Chemists and Colorists held a joint meeting at the Turks Head Club, Providence, R. I., on Friday evening, June 26, 1925.

The evening was devoted entirely to a social gathering; dinner was served at 6.30. Chairman Williams presided.

The speaker of the evening was Hon. Jesse H. Metcalf, United States Senator from Rhode Island. President Louis A. Olney preceded Senator Metcalf with an interesting discourse on the aims of the association. Both addresses are published herewith.

The Society was most fortunate in being honored with Senator Metcalf's attendance, and after the meeting a great many of the members remained to have the opportunity of meeting the Senator.

The dinner was of added importance as it occurred during the Chemical Equipment week. The attendance was 93, some of whom came from as far as New Jersey.

A rising vote of thanks was extended the speakers of the evening.

Mr. Culver was in charge of the banquet arrangements.

The meeting was adjourned at 9 o'clock.

Respectfully submitted,
A. N. DANA, Secretary.

The Association and Its Research Plans

By PROF. LOUIS A. OLNEY

I think this could well be called Chemist's Week in Providence.

In the first place, the American Institute of Chemical Engineers has been holding their meeting, and they are noted for their ability to arrange a program which combines business with pleasure. Whenever I have been able to attend their meetings I have always found them very enjoyable and profitable.

In the second place, there has been the Exposition of the Chemical Equipment Manufacturers, and that certainly has been well worth seeing. It is unique in a way, in that it is being run purely for those interested in the use of chemical equipment, and it is quite refreshing to go to this exhibition and find it possible to talk with various men at the head of the different exhibits without having a crowd jostling you and simply taking up the time and attention of those engaged by the Exhibitors, and in that way preventing the legitimate visitors from getting what they are looking for. I think in a way it has been a very successful adventure, and certainly if it is continued in future years, it should develop into a very valuable affair for the chemists of the country.

I also had the very great pleasure this morning of visiting the Metcalf Laboratory upon College Hill, and it certainly was quite different from the near-by laboratory where I began my experience as a chemist about twenty-eight years ago, being an instructor at Brown University for about a year before I went to Lowell. Brown University and the city of Providence and the chemists in this vicinity should be proud of that laboratory, and also glad that they have such a benefactor in

our guest of the evening who has made it possible for Brown University to have such a laboratory.

I have visited nearly all of the laboratories in the East, and most of the new ones that have been built in recent years, and while a few of them may be somewhat larger, I have not seen a laboratory that from my point of view was better arranged than the Metcalf Laboratory. It has a home-like appearance to it in some way which you cannot say of a great many laboratories, and the whole building seems to be well balanced, from the library, an extremely attractive and convenient work room, to the basement. I think the arrangements in the basement of that laboratory for handling supplies are remarkable, and the ventilating system also. I know that some of the laboratories in the country which have cost millions of dollars have been flat failures as far as ventilation is concerned, and I think some of them have already found it necessary to rearrange their ventilating system after they have been in use only a short time.

And then last, but not least, there is the meeting this evening which brings us all together as men of common interests in textile chemistry and dyeing. This week has certainly been very pleasurable to me and at the same time profitable and instructive.

I have spoken so many times before this same group of men, whose faces look so familiar that it is rather difficult to say anything that would be new. You know my interest in the association; you know how anxious I am for it to develop its research work: it was only about three months ago that I gave quite a lengthy talk along that line right in this room. I think, however, I might say a few words in regard to the returns from the questionnaires which we sent out some weeks ago in connection with the publication of the 1925 Year Book.

We were pleased, of course, to receive as many well filled out questionnaires as we did, but on the other hand, it is rather a disappointment out of an association consisting of between 800 and 900 members not to receive a greater number of questionnaires that were fully filled out, many of them simply having the name and address and not answering at all in regard to the points that we were particularly anxious to find out.

You must all remember that the success of the association depends, as you might say, 90 per cent upon the individual member and his interest and his willingness to co-operate. I think perhaps in the early fall we shall send out another questionnaire, and I hope that at that time every man who is here this evening will make it his business to study the questions and make some sort of reply, as that is about the only way we can ascertain the desire of the members in regard to the activities of the association.

You may remember that on the reverse side of the questionnaire there were the questions about the Active Members' Research Fund, and you might be interested to know how they came out. Approximately $1,500 has been subscribed up to the present time and the amounts range in most instances from $5 to $100. The idea of this fund is to help along, or at least help carry out the research work until such a time as our corporation memberships have become sufficiently well established. We believed, psychologically speaking, that this last spring was a poor time to have any sort of a drive that in any way involved textile manufacturers. I do not know that I like to call it a drive, as that word perhaps gives a wrong impression of what we have in mind. I would simply say an attempt to secure Corporation Members. A relatively large number of the members expressed the opinion that they believed it to be the province of the manufacturers engaged in the textile and color industries, whom it willl benefit more than anyone else, to support this work, rather than the individual members of the association, who as far as they may be able are willing to contribute their time and services in the accomplishment of such work.

You perhaps have heard that the National Association of Wool Manufacturers gave us a grant of $500 to help along our research work, and I believe that if we give evidence of having used this to advantage there will be further grants from the same source. A study of the possibilities of the research work that can be carried out by our association immediately indicates that a large sum of money will be needed if the work is to be properly done.

One thing above all others that we wish to accomplish is the tabulation of complete and accurate data in regard to the fastness of dyestuffs in terms of the standard methods which our Research Committee is working out. Up to the present time, as you all know, such tabulations have been produced almost entirely by the various dyestuff manufacturers. They, of course, are naturally interested in their own products, and for that reason such tables might be considered somewhat biased. They are, however, excellent in many ways, but when the data from different sources are compared there are found to be a great many discrepancies. We believe that eventually it will be possible to work out a system of tabulation whereby the fastness of at least all of the important dyestuffs could be recorded in terms of the standard methods of the association.

We hoped that we might have had with us this evening another notable man, one who has done a great deal for the science of chemistry, and one who at the present time is doing much to promote chemical education and chemical publicity among the younger generation of the country, as well as the older people. I have a telegram here which was received a few days ago:

"Sincerely regret am unable to be with you Friday evening because of illness in the family. Would like

very much to be there. Signed: Hon. Francis P. Garvan."

Mr. Garvan, as you know, is the president of the Chemical Foundation, and I think it was his earnest desire to be here to-night if he had found it possible.

At many different times, there have been discussions in our association in regard to H Ion Concentration, or the Ph value as we call it, and there is some very interesting apparatus at the exposition for recording the Ph value continuously. For instance, there is a recording instrument so arranged that, although it appears to be very complicated, seems to work perfectly in that it records hour after hour upon specially arranged cross section paper, the Ph value of the solution which is passing through it. If I had seen nothing else, this exhibit alone would have made the exposition worth while, although in addition there are many other interesting exhibits which I am sure will appeal to you.

I want to say just a word further about the exposition at the Armory before I sit down. I hope that all of those present this evening, if they have not been there already, will go to-morrow morning, if they remain in Providence. I understand the exposition is to be open until one o'clock so it will be well to make your plans to be there in the morning. I was out there last evening, and it is my opinion that it will surely be worth your while to attend.

I am very glad to be here this evening, but I certainly am not going to take up any more time as I know you have a very interesting speaker on the program.

Address by Hon. Jesse H. Metcalf, United States Senator from Rhode Island

Mr. Chairman and Mr. President, I thank you both for those kind words.

I was very much interested to-day to visit the exhibition at the Armory, and the only criticism that I have is that I do not think you have advertised it enough. It is a very unusual exhibition and I think more of our experts should have been there to see it. I was delayed in getting there so I did not have the time I wanted to spend there, but I was very much impressed with the quality of the exhibition.

Now, I just want to leave one thought with you to-night and that is, how to do better work. Better work can only come about by having better men, more intelligent men, men that have been through the Lowell Textile School, or Brown University, or the School of Design, where they teach chemistry and dyeing, for it is the good work that counts. I realized early in my manufacturing career that our dyers were not experts. It was even somewhat difficult to get expert chemists and I thought that the proper way to do this was to instruct young men in chemistry and in the art of dyeing, as it would make it so much better for all manufacturers to have expert dyers and expert chemists. They would turn out better work, they would be better men, they would be paid better, and our business would be better and more continuous. So, in my small way some years ago, I encouraged the School of Design to start a laboratory for chemists, particularly for colorists, and I cannot help but believe that they and other institutions have turned out better men, more expert, cultivated and honest men, and this cannot help but have a good effect on our industries.

You all know how some years ago it frequently happened that the drugs we bought were diluted with water, and salt seemed to be very popular with some dealers—not so popular with us as manufacturers—and there were very many sad occasions which came to me, as a buyer of drugs and as a dyer and manufacturer, through the use of all these adulterations.

I am going to tell you a story which might interest you. The head man of one of the largest chemical houses in the country came to me with a letter of introduction from a mutual friend and said, "You do not do business with us and we are very anxious to do business with you." I replied, "We will be very glad to do business with you and there are only two things that I have to insist upon. First, you must keep your product that you sell us exactly like the sample you submit. Second, you must leave my dyers alone." He said, "Why, of course, we will." I said, "You send me a barrel of your product, quote me a price that is fair to you and fair to me, keep your word to me and we will do business." He said, "Why, of course," and I gave him a fairly large order. Things went along very nicely for a week or two and the product was good. And then I found the product was falling off. I wrote a letter and said that I was not quite satisfied and asked if he could not get his product up to where it was previously. For a time the product was improved and then it fell off again and I advised him that I could not order any more. He came down to see me and asked what was the matter. I replied, "If you will remember my conversation with you, you were to furnish as good a product as the sample submitted and you were to leave my dyers alone. I do not consider that you have kept your word." He became very angry at me, was going to sue me, etc., and I said, "Come with me to the outer office," and I took him to the outer office and said to the clerk at the desk, "This firm has gone out of business so far as we are concerned; this man died to-day so far as we are concerned, and I do not like ghosts, so do not let him in."

I am going to tell you another story which was very interesting to me. One of our superintendents came to me and said: "The dyestuff we are now using is not giving us good results; the dyer says he does not like it. Would you mind getting some of John Smith's color?" I said: "I think you are wrong, but you can have John

Smith's color, so I ordered ten barrels of it; also ten barrels of the color we had been using. I had both shipments sent to my own shed and then I carefully took John Smith's powder out of the ten barrels and put it in the other ten barrels, and vice versa. I sent up the John Smith barrels containing the other powder and after waiting a little while, I asked how it was coming and he said: "No trouble at all; the color is good."

I waited a little while longer, and one day when the superintendent came to see me, I asked him again how it was coming. He said, "Fine, I am getting good results." I said, "I expected to hear that. I suppose you will be surprised to know that you have been using the very same color as before. Will you kindly tell your dyer to attend more to the dyestuff and less to the labels in the future." I had no more difficulty. The superintendent said: "I will never again come to you and complain when my dyer says the color is not coming right."

However, things are coming a great deal better now and I think that the whole trade is growing cleaner and better. We have cleaner and finer men working for us —the graduates of our educational institutions are a higher type of men and they won't stand for that sort of thing and I think that it is becoming more important to them and to all of us that "Honesty is the best policy" and that although there are some few drug firms that are still dead to me, yet it is very rarely that those things now occur, and I want to impress upon all of you young men here starting out, that "honesty in business is the thing that counts." Honest principles and good, hard work are what bring results. I thank you.

Testing the Fastness of Dyed Colors to Light

A Communication to the American Association of Textile Chemists and Colorists

From H. B. GORDON

United States Testing Company, Inc., New York City

Introduction—Samples Studied—Lights Studied—Procedure—Discussion of Data Obtained—Summary and Conclusions—Spectra of Lights Studied—Increasing Rate of Fading—Integration of Sunlight—Rate of Fading in Different Positions—Intermittent and Continuous Lighting—Temperature of Samples—Effect of Glass on Sun's Action—Indigo

ONE of the most important characteristics of a dye is its fastness or ability to remain unchanged in use. Dyes vary greatly in this respect, and although there are dyes available which are quite satisfactory, others are sometimes used which leave much to be desired. It is of the highest importance that the dye manufacturer, the dyer, and the purchaser of dyed materials should be able to test the fastness of colors without the necessity of submitting them to actual use. The American Association of Textile Chemists and Colorists have properly undertaken to standardize the methods for carrying out the tests of fastness to the various agencies. The laboratory with which the writer is connected having been requested to co-operate with the Research Committee of the Association in the study of the test for fastness to light, it was decided not merely to give the co-operation requested, but to carry on additional studies which would be, in part, supplemental to the work of the committee and of that previously done by the writer, and, in part, a study of a number of questions that have arisen in the work of the testing laboratory.

The problem of a practical test of fastness to light is to determine to what degree a color will be affected by sunlight. To do this it is not usually practicable to expose the color to sunlight to see how rapidly it fades, for in many cases the knowledge is desired in winter when sunlight has but little effect, even on clear days; and in other cases there are dust and fumes from factories in the air, which make the results of exposure to the sun unreliable, while at best the action of the sun varies greatly throughout the day, is only near a maximum for a few hours near noon, and is entirely lacking during a considerable part of the time. For these reasons an artificial light is desirable for making the fastness test.

In order to be suitable for use in testing the fastness of colors a light should (1) give essentially the same results with all dyes as does sunlight, (2) act more rapidly than sunlight, (3) show about the same rate of action as compared to that of sunlight on all colors, (4) operate without much attention, and (5) be accurately reproducible, in order that similar results may be obtained in different laboratories. To find a light which will meet these requirements and to find the rate of its action on

colors as compared to that of the sun is the problem before the dye tester. This problem can be attacked by comparing the action of the sun and various artificial lights on a great variety of dyess. This method was employed in the present study.

Samples Studied

The samples whose fastness to light were investigated consisted of two series. Of these, one series of forty colors were provided by the Association's Research Committee (William Cady, chairman), while the other series consisted of over sixty colors which had been the subject of a previous study by the writer (Textile Colorist, January, 1921). The former series will be referred to as "series T" and the latter as "series N" in the following pages. Names and other data for the colors are given in Tables 1 and 2 (pages 491 and 492).

Lights Studied

The lights to which these samples were exposed were sunlight, the white flame arc, and the mercury arc in quartz. Series T were exposed to all three of these lights both with a glass cover and without it. In addition, sets of this series which had been exposed to the violet carbon arc (in a Fade-Ometer) and to the sun under glass at Fall River, Mass., were examined by courtesy of the committee.

Series N were also exposed to the sun and white flame arc, both with and, in part, without a glass screen, but to the mercury arc only with the glass screen. In the previous study these colors had been exposed to the action of the mercury arc without a glass screen, and it did not appear worth while to repeat these tests. A part of this series were also exposed to the violet carbon arc in a Fade-Ometer.

The mercury arc lamp used in this study was a Uviarc lamp, put out by the Cooper-Hewitt Company. It had been in use 550 to 600 hours before the beginning of this study and was used about 300 hours while it was in progress. It was used on a 240-volt D. C. circuit. After conditions had become constant the lamp worked at 4 amperes and 180 arc volts.

The violet carbon arc studied was used in the Fade-Ometer, put out by the Atlas Electric Devices Company; Columbia violet carbon electrodes were used. The current employed was about 11.9 amperes, corresponding to about 148 arc volts.

The white flame arc lamp was similar in a general way to the one used with violet carbons except that it was without housing. It is also put out by the Atlas Electric Devices Company. It worked at about 26.6 amperes and 60 arc volts. Some of the preliminary work with this light was done with a lamp loaned by M. J. Wohl & Co. All the carbon arc lamps used lower electrodes ½ by 4 inches and upper electrodes ½ by 12 inches.

The glass used as a screen, unless mention is made to the contrary, was obtained from old photographic plates by removing the gelatine film and cutting to a convenient size. Plates of medium greenness were selected and only those between 6/100 and 7/100 inch in thickness were used.

Procedure

In making the exposures a part of each sample was protected at all times from the light, but other portions were exposed for different periods. For series T, exposed to the mercury arc light without a glass screen, the exposures were for 4 to 10 hours. With a glass screen the exposures were for 46 and 70 hours.

Series N were exposed to the mercury arc light with glass screen only. The exposures were for 33 and 65 hours.

In exposing to the white flame arc light the samples were attached to wooden blocks supported on a ring, at the center of which was the arc. The distance from the arc to the color samples was ten inches. Both series of samples were exposed with no glass screen for 2, 6 and 12 hours. Some of the faster colors were given additional exposure to make a total of 28 hours. Both series were also exposed to the white flame arc as above but with a glass screen. In this case the fastest colors were exposed 80 hours, those of medium fastness for 38 hours, and the most fugitive for 18½ hours.

Both series of colors were exposed to the sun in New Brunswick, New Jersey. All samples were exposed both with and without glass screens. Exposures were for 25, 50 and 100 hour periods. The exposures were made on top of a four-story building. The samples were placed on a frame which sloped toward the south at such an angle that the sun's rays, at noon, were approximately perpendicular. Exposures were made only between the hours of 9 A. M. and 3 P. M. on fair days during July and the first few days of August, 1923.

Data Obtained

The samples, exposed as described above, were compared and an estimate made as to the relative rates of action of the different lights on each sample. If the action on a sample of any light differed greatly in kind from that of other lights, the fact was noted. The data obtained in this manner for series T and series N are given in Tables 1 and 2 respectively.

In both tables column one gives the number of the colors in the series; column two gives their names; column three their classes; column four their fastness to sunlight. The system of classification with respect to

fastness is explained later. Column five (New Jersey sun) gives the rate of action of New Jersey sunlight. This is taken as standard, to which all other rates of action are compared and is assumed as unity in all cases. Column six (New Jersey G sun) gives the rate of action of New Jersey sunlight when the samples are covered with glass; column seven (WF), that of the white flame arc; column eight (WFG), that of the white flame arc with glass screen; column nine (fade), that of the violet carbon arc (in the Fade-Ometer); column ten (Hg G), that of the mercury arc with glass screen. In Table 1, column eleven (Hg) gives the rate of mercury arc with no glass screen. In both tables the last column (Int) before remarks refers to intermittent lighting of samples. It will be discussed later.

The classification with respect to fastness to light—four "fast," both tables—is made on the following basis:

Class 1.—Exposure to New Jersey sun 100 hours caused no appreciable change in the sample.

Class 2.—An appreciable change was caused by 100 hours, but not by 50 hours' exposure.

Class 3.—An appreciable change was caused by 50 hours' exposure.

Class 4.—A slight change was caused by 25 hours' exposure.

Class 5.—A considerable change was caused by 25 hours' exposure.

Class 6.—A great change was caused by 25 hours' exposure.

Class 7.—The color was nearly or quite destroyed by 25 hours' exposure.

This is the system of classification used in the writer's previous paper on this subject, except that in that case Arizona winter sunlight was made the standard instead of New Jersey summer sunlight, and the periods of exposure were longer than in the present study.

Discussion of Data

From a consideration of the data in Tables 1 and 2 it is evident that there is great variation in the effects of the different lights on the samples. We see that sunlight is greatly modified by its passage through glass. This may decrease its effect on the colors, but little or even increase it slightly, or may decrease it to but a fraction of its rate in the absence of glass. The decrease in effect due to glass is easily explained as due to the absorption of much of the ultra violet and some light of longer wave length. The increase in effect is not so easily explained. This might be due to the slowing up of one of two antagonistic effects of the light, permitting the other to show its effects more clearly than in the absence of the glass, or to an invisible effect of the glass by which some light in passing through it is changed to a wave length which is more effective than the original in fading the color under consideration.

On an average the glass cut down the action of the sunlight about one-third. This result was checked by comparison with a set of these colors (series T) which had been exposed to the sun under glass at Fall River, Mass. The average rate at which they were affected was almost exactly the same as that of the samples exposed under glass in New Jersey, and there was also good agreement in the reduction of action on the different dyes, but in no case did they check an increase in action by the glass screen.

It is seen from the tables that the effect of the violet carbon arc (Fade-Ometer) was very similar to that of the sun, but considerably more rapid. The data in Table 1 are for a set of these colors which were examined by courtesy of the committee of the American Association of Textile Chemists and Colorists. It was not originally intended to expose series N (Table 2) in the Fade-Ometer, but considerations to be discussed later made it appear worth while to expose a part of the series. The rate of action on these samples was slightly less, as compared to the sun, than on series T.

The effects of the white flame arc without glass shield were decidedly erratic. The rate of action, as compared to that of sunlight, varied so greatly as to render this light of little value in testing fastness. In Table 1 we see the rate varies from 1.5 to 80 times that of the sun for direct colors, and for acid colors from 1 to 10 times. The number of dyes in other classes is too small to permit conclusions to be drawn, but Table 2 shows results on a larger variety of colors. In this table the rate of action as compared to that of the sun varies for direct colors from 2 to 25—about fourteen on an average—with somewhat similar relations for the developed, sulphur and vat colors studied. On basic colors (on cotton) the effect is more constant, but somewhat slower—about nine times that of the sun. With a glass screen the effect of the white flame arc is much slower and less erratic, but is still very irregular.

From the results of a previous study of this subject the writer concluded that the results obtained with the mercury arc light, without a glass shield, are too erratic in rate and different in nature, as compared to those produced by the sun, to warrant the use of this light for making a standard test. For this reason, and because the samples for which data are given in Table 2 had been the subject of the previous study, these samples were not exposed to the mercury arc in the present study except with glass shield. In Table 1 we see the results obtained with this light are not more erratic, as compared to those of sunlight, than with the white flame arc without glass shield, but yet are far too irregular for the light to be satisfactory in specifying a standard test. With glass screen the action of the mercury arc is greatly decreased

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Table 1 - Series T

I # of Dye	II Name of Dye	III Class	IV Fast	V N J Sun	VI N J Sun	VII G WF	VIII WFG	IX Fade	X HgG	XI Hg	XII Int	Remarks
1	Azo Phloxine G A	acid	2	1	.8	8	.3	2	.8	50	1.2	Hg browner, HgG and Fade less brown than sun.
2	Orange I	"	2	1	..6	1	.7	1.8	1	12	1.2	
3	Tartrazine	"	1	1	.7	2	.4	1.7	.9	50	1.0	Hg very brown; WF and WFG too slow to compare well.
4	Erie Green Ex.	Direct	4	1	.6	2	1.2	2	1.5	10	1.0	Hg yellower than sun; most effect of HgG in first period.
5	Indigotine CCC	Acid	5	1	.3	5	1	2	1.5	25	1.0	HgG most change first period; Hg yellower than Sun; WF browner
6	Indocyanine B	"	2	1	.3	6	.5	1.5	1.3	30	1.2	HgG too slow to compare well.
7	Acid Violet S 4B	"	5	1	.7	4	2	1.5	1.2	10	1.3	Hg darker than others.
8	Acid Violet RL	"	4	1	.2	5	1.2	1.8	1.3	50	1.0	NJG less brown than NJ; Hg browner.
9	Erie Fast Scar. 4BA	Direct	5	1	.6	3	1.5	1.5	.9	12	1.5	Hg browner than Sun.
10	Chrysophenine	"	1	1	-	-	-	-	-	-	-	Changes too slight for good comparison Brown in Hg.
11	Pontamine Gr.GX	"	4	1	.6	1.5	.5	1.3	.6	6	1.0	
12	Dir. Fast Blue R W	"	6	1	.9	1.5	1.5	1.2	1	6	2.0	Hg turns grayer.
13	Diamine Vi. N	"	2	1	.5	10	.9	2	1.3	40	1.2	Hg brownest; sun browner than others.
14	Ciba Blue 2 B D	Vat	4	1	1	12	1.3	1.5	.9	50	1.0	Hg browner than others.
15	Sulphogene Br Gr 2G	Sulphur	3	1	.6	10	.6	1.5	1.1	50	1.0	Hg browner than others.
16	Benz. F. Yel. 4 GL	Direct	3	1	.6	15	3	4	4	50	.8	All arc lights browner than sun.
17	Diam. F. Red 8 BL	"	4	1	.8	45	1	2	1	50	1.2	Hg destroys color (brown) quickly.
18	Indigo	Vat	4	-	.7	6	.7	3.5	3.5	45	1.2	NJ Sun sample lost; NJG Sun used as standard.
19	Pont. Violet N	Direct	5	-	.7	15	.8	1.8	1	45	1.5	NJ Sun sample lost; NJG Sun used as standard
20	Alphanaph. Claret	"	4	1	1.2	3.5	2	1.5	1.3	10	.8	
21	Pont. Fast Blue L	Direct	3	1	.6	15	1.5	1.7	1.2	100	.8	WF and Hg browner than sun.
22	Ciba Sarlet G	Vat	5	1	1.2	15	1.5	2.3	1.8	50	1.5	" " " " " "
23	Diam. Fast Bl FFB	Direct	3	1	.5	80	.7	1.7	1	100	.9	Hg destroys color quickly.
24	Indan. Vi. RR	Vat	4	1	.5	10	.6	1.3	1.3	100	.9	Hg destroys color quickly.
25	Anthrene Jade Gr.	Vat	2	1	.7	15	-	2.5	1	100	1.1	Change with WFG too slow to judge.
26	Katigan Blue 2B	Sulphur	2	1	.6	15	.7	2.	1.3	100	1.2	Hg destroys color quickly.
27	Para. Nitraniline Red	Developed	2	1	1.0	3	.9	1.5	1	50	1.0	Fades too slowly to compare well.
28	Fast Fuchsine 6B	Acid	4	1	.6	10	2	1.7	1.2	100	1.2	Quickly destroyed by Hg.
29	Patent Blue VS	"	4	1	.3	9	2	2.3	1.5	40	1.0	" " " "
30	Fast Ac. Vi. 10B	"	6	1	.7	5	2	1.5	1.3	15	1.5	" " " "
31	Indigotine	"	5	1	.6	10	2	1.5	1.2	15	1.0	" " " "
32	Metanil Yellow	"	3	1	.5	7.5	1.6	1.5	.9	15	1.0	
33	Tartrazine	"	4	1	.6	8	.7	1.2	1.3	20	1.0	
34	Brill. Gr. Cryst.		5	1	.4	7	2.5	1.5	1	25	1.2	
35	Direct Sky Blue	Direct	5	1	.7	3.5	1.7	1.3	1.1	15	1.2	
36	Rhodamine B	Basic	4	1	.6	5	1.5	1.3	1.2	15	1.2	
37	Direct Violet R	Direct	6	1	.6	4	1.6	1.2	1.3	10	1.1	Fades too rapidly to compare well
38	Methyl Violet 4B	Basic	6	1	.9	7	2	1.3	1.2	15	1.0	Fades too rapidly to compare well
39	Pont. Orange R	Direct	4	1	.9	7.5	1.5	1	1	6	1.0	Fade-Ometer redder than others
40	Erie Red 4B	"	5	1	.9	2.5	1	1.1	.9	10	1.2	

and is made less irregular. It is still less regular, however, and also somewhat slower than the violet carbon arc in the Fade-Ometer.

The decrease in the rate of action of the mercury arc light caused by a glass screen is readily understood as due to the absorption of much of the ultra-violet, particularly that of extremely short wave length. Since most of the effect of this light is due to the ultra-violet, it is natural that its absorption should have the effect observed. The writer has been informed that certain colors which are faded rapidly by sunlight appear very fast to the mercury arc light, but that by using a glass screen the results of the sun are duplicated by the mercury arc. No doubt this is due to a great increase in the time of exposure with a glass screen. In the writer's experience no colors are faded more rapidly by the glass shielded mercury arc than by this light without the glass screen, but in some cases the elimination of the browning effect of the ultra-violet permits the true fading to be more apparent when the glass screen is used. However, if a glass screen can really increase the action of sunlight, as appeared to be the case for a few colors in this study, and if this is due to a change in wave length of the light by passing through the glass, this effect might well be expected in the mercury arc, since ultra-violet is especially susceptible to influences which change the wave length. The writer has previously observed and has been informed that certain colors are faded by the sun but are very fast to mercury arc light. This is no doubt due,

(*Continued on page 497*)

Table 2 Series N

I No. of Dye	II Name of Dye	III Class of Dye	IV Fast	V N J Sun	VI N J G Sun	VII W F	VIII W F G	IX Fade	X HgG	XI Int	Remarks
1	Erie Red 4B	Direct	6	1	.9	3.5	1.5	1	1	1.2	
2	Erie Fast Red FD	"	5	1	.9	10	2	1.5	1.3	1.2	
3	Erie Green WB	"	6	1	.8	15	1.1	1	.6	1.2	Too fugitive to judge well
4	Erie Green MT	"	6	1	.6	10	1	1.4	.8	1	" " " " "
5	Erie Green WT	"	6	1	.7	15	1.1	1.4	.6	1.2	" " " " "
6	Erie Yellow KM	"	5	1	.5	15	1.5	2	1	1.2	WF browner than the sun
7	Erie Yellow F	"	5	1	.6	15	1.3	1.8	1	1	Lamps browner than the sun
8	Erie Fast Yel. WB	"	2	1	.7	12	3	2	.8	1	WF browner than the sun
9	Niagara Blue 3B	"	6	1	.7	25	1.6	1.4	1	1.2	Sun browner than Fade; WF browner still
10A	Niagara Blue G	Self.	6	1	1	10	1.5	1.5	.9	1	WF browner than the sun
10B	Niagara Blue G	$CuSO_4$	2	1	X	25	3	X	X	1	Fades too slowly to compare well
11	Niagara Blue BR	Direct	5	1	.8	20	1	1.4	1	1.2	
14	Chrome Gr. CB	Chrome	5	1	.6	4	2	---	2	1.2	
15	Serichrome Gr. B	Chrome	3	1	.8	2	1	---	1.5	1	
18	Serichrome Blue R	Chrome	2	1	X	6	1.5	X	1.5	1	Fades too slowly to compare well
19A	Sulphur Red Brown	Self	4	1	.7	12	---	---	1	---	
19B	Sulphur Red Brown	Af. Treat.	4	1	.7	15	---	---	1.3	---	
20	Sulphur Green T	Sulphur	3	1	.6	10	1.2	1.3	1.4	1	WF browner than sun
21	Sulphur Brown 4G	"	4	1	.9	3.5	1	---	.9	1	
22	Sulphur Blue L	"	4	1	.6	12	1.5	1.8	1.4	1.2	Fade & WF browner than sun
23	Carbanthrene Blue R	"	3	1	.6	12	1	1.4	1	1	WF browner than sun
24A	Primuline	Self	4	1	.8	2	1.5	1.5	.8	1	Fade & WF browner than sun
24B	Primuline BN	Developed	6	1	.9	6	1	---	2	1.1	
25A	Diazine Black DB	Self	5	1	.6	25	1.5	1.4	1	1.2	WF browner than sun
25B	Diazine Black DB	BN Devel.	4	1	.5	12	.6	1.4	.7	1.1	WF browner than sun
25C	Diazine Black DB	MTD Devel.	5	1	.6	25	1.5	1.4	1	2	WF browner than sun
27A	Diazine Black H	Self	5	1	.6	12	1	---	.8	2	WF browner than sun
27B	Diazine Black H	BN Dev.	5	1	.7	15	2	1.3	1	2	WF browner than sun
27C	Diazine Black H	MTD Dev.	5	1	.7	15	1.4	1.4	1	1.5	WF browner than sun
28	Fuchsine P	Basic	4	1	.9	6	---	---	1.2	---	
29	Safranine A	"	4	1	.8	8	---	---	1.4	---	Speeds WF and HgG differ at various periods
30	Victoria Green WB	"	6	1	1	7	---	---	1	---	WF speed differs in various periods
30A	Vic.Gr. WB Cryst.	"	6	1	.9	10	---	---	1.2	---	Speed HgG differs in various periods
31	Methylene Green B	Basic	4	1	.7	15	---	---	2	---	
32	Auramine	"	5	1	.9	10	---	---	1.2	---	WF differs at various periods
33	Bismarck Br. Y	"	6	1	1	7	---	---	1.2	---	
34	Victoria Blue B	"	6	1	1.1	7	---	---	1.2	---	Action of sun hastened by glass
35	Meth. Blue BB	"	4	1	.7	12	---	---	1	---	WF browns; HgG darkens
36	Buffalo Fast Fuch. D	Acid	5	1	.6	2	1.2	---	1.1	1.1	Sun darkens
37	Buff. Fast Fuchsine G	"	3	1	.9	X	X	---	X	1.1	Fades too slowly to compare well
38	Croceine Scarlet 10O	"	2	1	X	4	.7	---	1	1	" " " " " "
39	Fast Red S	"	3	1	.5	2	.8	---	1	1.1	" " " " " "
40	Cloth Red B	"	3	1	.5	2	1	---	1.5	1.2	" " " " " "
41	Azo Graphic Red R	"	3	1	.5	1	.7	---	.7	1	" " " " " "
42	Acid Green L	"	5	1	.4	4	2	---	1	2	
45	Wool Yellow Ex.	"	2	1	.6	X	X	---	X	1	" " " " " "
46	Erie Yellow Y	"	2	1	.6	5	1	---	1	1	" " " " " "
47	Azo Yellow A W	"	6	1	.5	10	2	---	1.5	1	
48	Fast Wool Blue B	"	3	1	.5	5	1.5	---	1	1	Fades slowly. WF darkens sample
49	Fast Wool Blue R	"	2	1	.5	6	1.5	---	1.2	1	Fades slowly. WF darkens
50	Fast Wool Cyanone R	"	3	1	.6	5	1.5	---	1.5	1	
52	Indigotine	"	6	1	.4	4	1	---	1.5	1.2	
53A	Alizarine Sapphire	Self	3	1	.3	7	1	---	1.3	1	
53B	Alizarine Sapphire	Chrome	3	1	.4	5	1	---	1.4	1	
54	Carban. Olive G	Vat	4	1	.7	12	---	---	1	---	Most of change in first period. WF darkens.
55	Carban. Green B	"	3	1	.7	30	---	---	1	---	
56	Carban. Yel. 6	"	6	1	.7	10	---	---	.8	---	Color changes quickly, partly recovers in dark.
57	Carb. Yel. 3 GN	"	6	1	.8	10	---	---	1	---	Most change first period.
58	Indigo	"	4	1	.7	2	---	---	1	---	
59	Carban. Blue R	"	3	1	.8	20	---	---	1	---	
59A	Carban. Blue RS	"	2	1	X	12	---	---	1	---	Fades too slowly to compare well.
60	Carban. Blue G.CD	"	2	1	.4	15	---	---	.8	---	Fades too slowly to compare well. WF brown.
62A	Carban. Red	"	3	1	.7	10	---	---	1.2	---	Fades too slowly to compare well. WF brown.

SUMMER OUTING OF NEW YORK SECTION

The summer outing of the New York Section was held Friday, June 26th, at the Greenbrook Country Club, North Caldwell, N. J.

A golf tournament was held in the morning, as a result of which Dr. E. H. Killheffer captured both a cup offered by Chairman Grandage of the New York Section for low gross score and a handicap cup offered by the AMERICAN DYESTUFF REPORTER for low net score.

A buffet luncheon was served at the clubhouse after which a baseball game between the "Millguys," captained by Herbert Grandage, and the "Dyestuffers," captained by W. E. Mitchell, was played, with the result that the "Millguys" won by a score of 11 to 10.

Silvern trophies offered for lowest gross and net scores were both annexed by Dr. Killheffer, here shown displaying evidences of his prowess at request of photographer.

Over she goes! Charles F. Schaumann playing out of a sand hazard during tournament. In justice to the subject, however, it is only fair to explain that he was never in one except at the request of the photographer.

The game was enlivened by several spectacular plays and not a few acrobatic slides and tumbles. Scrubbed elbows and shinbones were common, but fortunately no serious casualties marred the program. Umpires Feibiger and Sleeper are to be highly commended for their intelligent interpretation of some of the confusing tangles that occurred on the field.

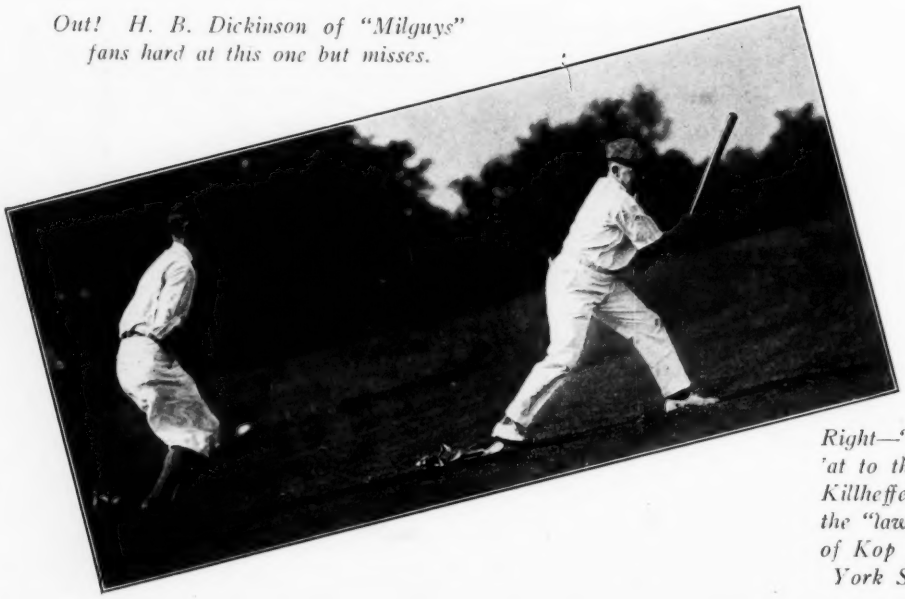
During the afternoon events several arrests were made by Officer Wilmot, whose trusty club and lusty lungs put fear in the hearts of those who had stolen bases.

The accompanying photographs give some conception of the high-spots of the ball game, and include several unusual and interesting views of dramatic moments in the golf tournament.

The outing was concluded by a very excellent dinner served at the club, which was attended by approximately sixty members and guests. All who attended voted the occasion the most successful of its kind which has been held.

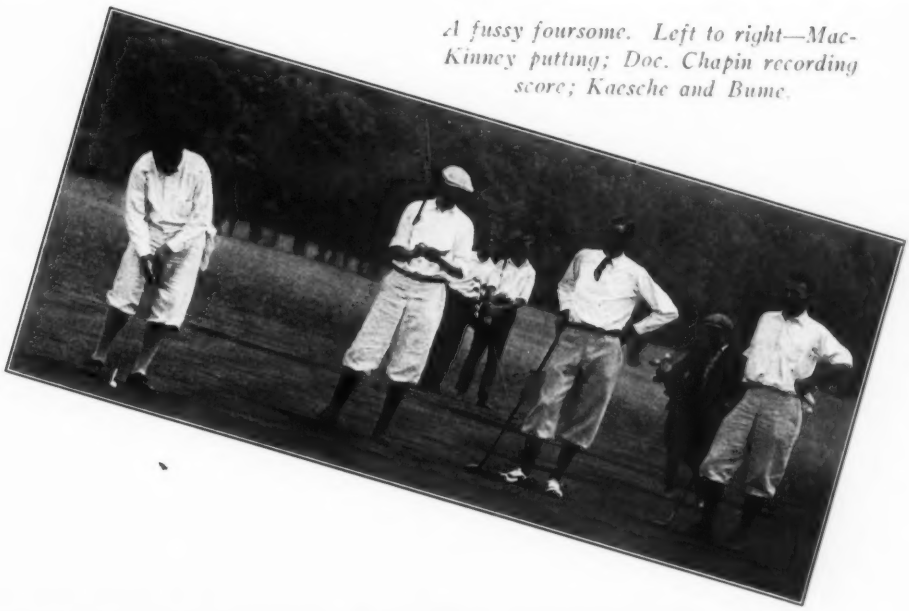
D. P. KNOWLAND, Secretary.

Out! H. B. Dickinson of "Milguys" fans hard at this one but misses.



Right—"Ah g'wan—tell 'at to the judge!" Dr. Killheffer runs afoul of the "law" in the person of Kop Wilmot at New York Section Outing.

"The gang's all here!" Members of New York Section, American Association of Textile Chemists and Colorists

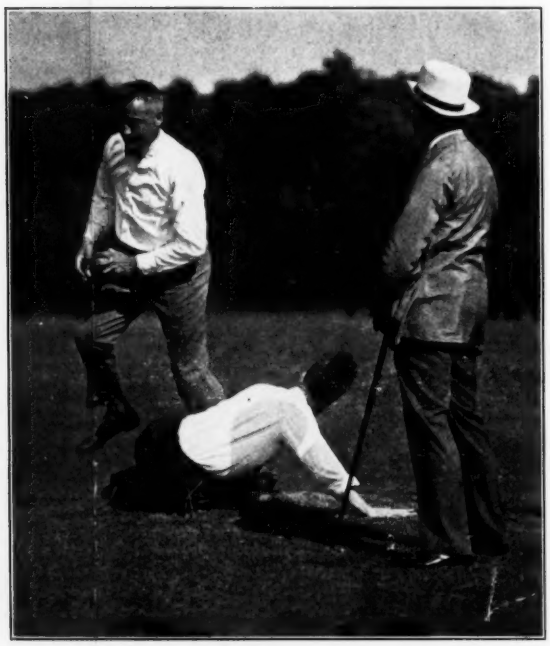


A fussy foursome. Left to right—MacKinney putting; Doc. Chapin recording score; Kaesche and Bume.

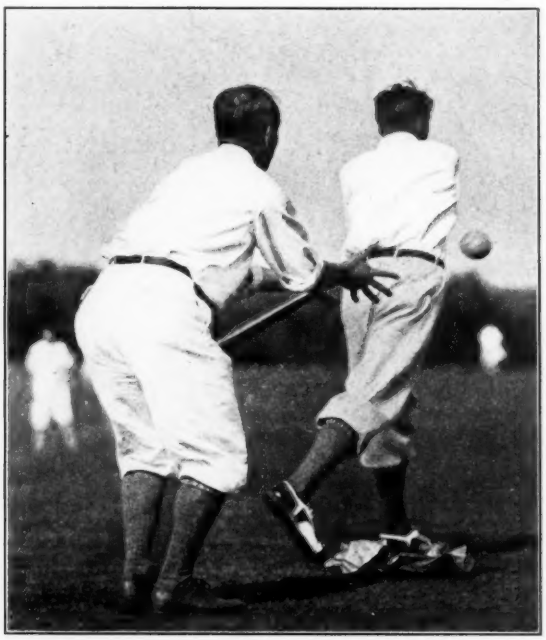
nd Colorists and their guests at the Third Annual Outing at the Green Brook Country Club, North Caldwell, New Jersey.

"Don't you touch me!" Todebush, about to be tagged out by Wilmot at third, puts up both hands to ward off the inevitable.

Give your own decision—Herbert Grandage and Hugo H. Todebush in a general melee at first base. Note that Grandage has his foot on base and that Todebush is taging him between puffs. Umpire reserved ruling on advice of counsel.



This is Harry Stulz put out at first by Louis Hirsch. Umpire Fiebiger with cane.



Unusually clear action picture of Max Kaesche swinging vainly at ball, shown in midair, which Catcher Schaumann awaits with outstretched hands.

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TESTING THE FASTNESS OF DYED COLORS TO LIGHT

(*Continued from page* 492)

as mentioned by Heermann (Chem. Zeitung, 48, 813 and 834, 1924) to the fact that mercury arc light lacks certain wave lengths which fade some colors.

When the samples of series N, exposed to sunlight as described above, were compared with samples cut from the same pieces which had been exposed to the sun in Arizona in the winter of 1920 and others that had been exposed in New Jersey in the summer of that year, it was found that the Arizona sun had acted on the colors only a little over two-thirds as rapidly and the New Jersey summer sun of 1920 over three times as rapidly as the New Jersey sun in the summer of 1923. As the earlier samples were exposed in New Jersey for only 75 and 90 hours a comparison was not very satisfactory, but the great difference in speeds was sufficiently apparent. Both these sets of samples were exposed at New Brunswick. The later set were exposed on top of a rather high building, which stood on a hill, about a mile distant from the low building on which the earlier exposures had been made. The later exposures were farther from the center of the city than the earlier so that the atmosphere above them was clearer and would be expected to fade as rapidly as the earlier samples. The great difference observed caused considerable thought.

That the samples exposed in 1923 were acted on as rapidly as could be expected that summer was indicated by the fact that series T, as mentioned above, were affected about the same (under glass) in two different places. The question then arose as to whether the colors of series N had become faster by storage or those which had been exposed in 1920 had been greatly changed by it. Both of these questions were answered in the negative by exposure of a part of series N in the Fade-Ometer, using the same conditions as in the previous study. Some of the previously exposed samples had become noticeably browner than the freshly exposed samples, as had also some samples which had been exposed to the sun, but as far as could be told the Fade-Ometer had the same rate of action in the two studies. It therefore follows that the light of the sun at New Brunswick in June and early July, 1920, was over three times as effective as in July and early August, 1923. This emphasizes the difficulty of comparing the effects of arc lights with those of sunlight and of specifying the conditions for a standard test in terms of sunlight.

Summary of Data

The data given in Tables 1 and 2 are summarized in Table 3. Column headings have the same significance as in Tables 1 and 2. Numerals 1 and 2 head columns from Tables 1 and 2 respectively. Maximum, minimum, and average rates of action, as compared to sunlight, are given for each light. The ratio of maximum to minimum rates is also given. This ratio may be taken as a measure of the constancy of the action of any light as compared to that of sunlight.

Conclusions

From the foregoing data and discussion it appears clear that among the lights studied the best for a standard test is the violet carbon arc, for (1) its results compare more closely with those of the sun than do those of the other lamps and probably as closely as results obtained with sunlight at different times and places; (2) the action is about one and two-thirds times as fast as for New Jersey summer sunlight—about two and one-half times as fast as for sunlight with glass screen; this is considerably faster than the action of the mercury arc light with glass screen, which is the only other artificial light studied which gives results which are at all satisfactory; (3) the constancy of its rate of action as compared to that of the sun, shown by the ratio of its maximum and minimum rates, is better than for the other arcs and equal to that of sunlight with glass screen; (4) the lamp will operate 24 hours and more without attention. The mercury arc requires still less attention, but the white flame arc must be "trimmed" rather frequently; (5) if the voltage and current are maintained constant, the constancy of the light depends upon that of the electrodes. That the manufacturers of the electrodes are maintaining a fairly uniform product is evident from the fact that samples exposed in the Fade-Ometer in 1923 and compared with similar samples exposed in it in 1920 indicated essentially the same rate of action in all cases where a browning of the older sample did not interfere with the comparison. Further support of the reproducibility of the violet carbon arc is given by the fact that a set of

TABLE 3

	W F		W F G		Fade		Hg	Hg G		N. J. G.		Int.	
	1	2	1	2	1	2	1	1	2	1	2	1	2
Maximum	80	30	3	3	4	2	100	4	2	1.2	1.1	2	2
Minimum	1	1	0.3	0.6	1	1	6	0.6	0.6	0.3	0.4	0.8	1
Average	10	10	1.3	1.3	1.7	1.5	39	1.3	1.1	0.66	0.69	1.1	1.2
Max./Min. ...	80	30	10	5	4	2	17	7	3.3	4	2.8	....	

colors, "series T," which had been exposed in a Fade-Ometer in another laboratory were compared with those exposed in this laboratory to the Uviarc with glass screen, and the relation found was essentially that of the Fade-Ometer in our own laboratory and the same Uviarc. It has been observed (William H. Cady, report to the American Association of Textile Chemists and Colorists, AMERICAN DYESTUFF REPORTER, January 26, 1925) that the same Fade-Ometer has produced perceptibly different results at two different times. The report does not show that the lamp was working under the same voltage and current at both times, though this may be assumed as conditions were said to be the same, nor that the samples were exposed in the same part of the frame at both times. As will be shown later, a sample exposed in the upper sample holder is faded perceptibly faster than if in the lower holder. Another thing which may cause a change in the rate of fading in the Fade-Ometer is the fouling of the globe. It should be cleaned carefully and at regular intervals.

The rate of fading by the mercury arc lamp, on the other hand, depends not only on the electrical conditions which may usually be kept sufficiently constant, but also on the type and age of the lamp, and even different lamps of the same type differ in efficiency and in rate of aging to such a marked degree that one cannot expect any approach to the same rate of action on dyes by two lamps. It has been stated (O. R. Flynn, AMERICAN DYESTUFF REPORTER, vol. 12, pp. 837-43, 1923) that increasing the fall of potential in a mercury arc by 2 volts for each 100 hours it is in operation during its first 500 hours very nearly overcomes its tendency to fade more slowly as it grows older, but the writer's experience and that of others indicate that, as stated above, different types of lamp and even different lamps of the same type show different rates of aging.

SPECTRA OF LIGHTS STUDIED

It seems somewhat strange that the white flame arc with glass screen does not affect colors more nearly as the sun affects them than does the violet carbon arc. A close similarity between the actions of sun and white flame arc was reported by Mott (Trans. Am. Electro Chem. Soc., vol. 28, 1915, pp. 371-400) who also gave spectrum photographs which seemed to show the spectrum of the white flame arc to resemble that of the sun much more closely than does that of the violet arc. The color of the white flame arc light appears to the eye much more like that of sunlight than does that of the violet carbon arc. Nevertheless, it was found in the present study, as shown by Tables 1, 2 and 3 that the rate of fading by white flame arc light, as compared to that caused by sunlight, varies much more for different dyes than if fading by violet carbon arc light is considered. This indicates that there is a greater difference in the quality of light from the sun and white flame arc with glass screen than between light from the sun and the violet carbon arc, also with glass screen. This conclusion is sustained by the results obtained by others who assisted the work of Mr. Cady's committee by exposing the samples of series T to the white flame arc.

This result shows that the eye is not reliable as a judge of the quality of light for fading purposes. This is to be expected for much of the fading is caused by ultra-violet light, which is, of course, invisible. Further, a light may affect the eye as "white" when it is made up of a few complementary wave lengths or as colored if it has a continuous spectrum, one region of which is more intense than the others.

Each light used in this study has two spectra—a continuous one, and superimposed on this a line spectrum. Which of these will appear the more prominent in a spectrum photograph depends not only on their relative intensity, but also on the manner of making the photograph. In Fig. 1 are shown photographs of spectra of the lights used. As these were made with a glass optical system the short wave length ultra violet is, of course, not shown. The spectra numbered 1 to 5 are, in order,

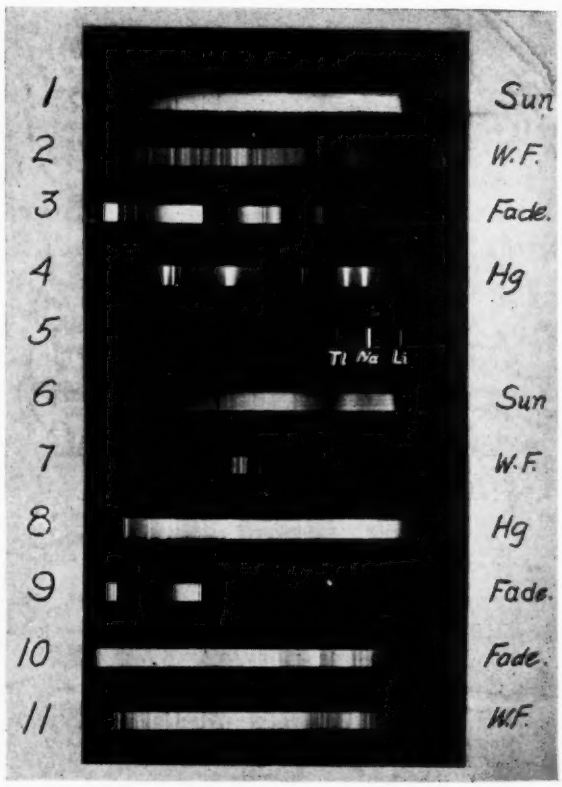

FIG. 1

those of the sun, white flame arc, violet carbon arc (Fade-Ometer), mercury arc, and the metals lithium, sodium and thalium, whose wave lengths in millionths of a millimeter are 671,589 and 535 respectively. Number 5 enables one to locate the lines of the other spectra with sufficient accuracy. It appears from these photographs that the violet carbon arc (3) is hardly as much like that of the sun (1) as is that of the white flame arc (2).

If the photographs of the sun and white flame arc spectra are printed to bring out their lines and that of the mercury arc to emphasize its continuous spectrum, we obtain pictures such as 6, 7 and 8, from which one might suppose the mercury arc light has a more nearly continuous spectrum than the sun. Pictures 9 and 10 show the spectrum of the violet carbon arc, printed to emphasize its line and continuous components, respectively. Number 11 shows the white flame arc printed to appear continuous. The same negative will give prints such as 7 and 11, according to time of printing.

Obviously, curves showing the intensity of radiation for each wave length are more reliable than photographs as means for comparison of qualities of different lights.

Increasing Rate of Fading

Though the violet carbon arc, as used in the Fade-Ometer, is more satisfactory than the other lamps used in this study, it would be better if its rate of fading could be increased. This could be done by moving the samples nearer the arc. If the lamp was used without housing and the samples hung free with no backing, they could probably be hung within six or seven inches of the arc without becoming too hot. The rate of fading would thereby be increased to four or five times that of sunlight.

Another method for increasing the rate of fading of the arc light is by using several arcs. About half of the available electric energy is usually wasted in the rheostat in series with a dye testing lamp, but in the white flame arc lamp mentioned as used in preliminary experiments, this energy was used to operate a second arc. The two arcs were in series, about two inches apart, with a metal vane between them. The light from the two arcs is, of course, twice as effective as that from but one.

It should be possible to arrange two violet carbon arcs in series on a 220-240 volt circuit, thus avoiding waste of electric power and hastening the test. If these two arcs are placed three inches apart and are regarded as on the circumference of a circle of two-inch radius, and another circle be drawn concentric with the first circle but with a radius of twelve inches, then the light from the two arcs will be fairly evenly distributed on the circumference of the large circle where the vane does not cut off the light from one of the arcs. This arrangement is indicated in the accompanying diagram, Fig. 2, in which c is the center, C and C′ are parts of the circumference of the large circle, r is the radius of the small circle, R and R′ are radii of the large circle, A and A are the two carbon arcs, and v is the metal vane. Although as stated

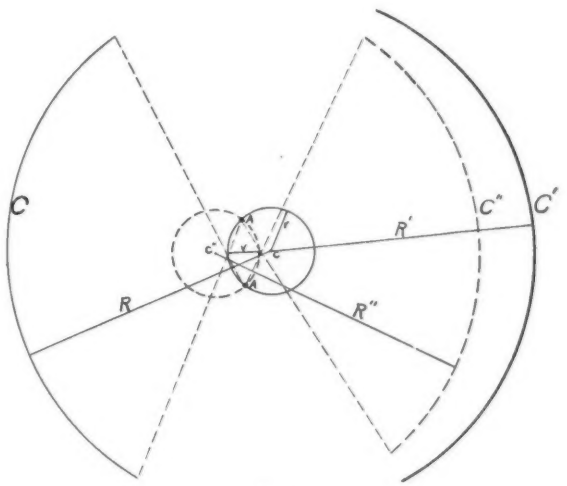

Fig. 2

above, the light from the two arc lights is fairly evenly distributed over each of the arcs of the large circle, C and C′, it is evident that the Intensity of illumination on C is greater than on C′, for the carbon arcs are much nearer the former. To find the line toward C′ on which the illumination equals that on C it is only necessary to construct another circle whose radius equals r and on whose circumference both the arc lights are located, and then from the center of this circle, c″, draw the arc, C″, whose radius, R″, is equal to R. The arcs C and C″ are symmetrically located with respect to the carbon arcs and are illuminated evenly enough for practical testing purposes over 110 or 120 degrees of each. If the distances are as specified above, the light will be about 1¾ times as intense as if a single carbon arc were used and the fading of samples on the arcs C and C″ should be about 1¾ times as rapid as in the Fade-Ometer, or 2¾ times as rapid as in New Jersey summer sunlight. The samples should not become excessively hot if they are hung without backing and no lamp housing is used.

Integration of Sunlight

The fact that there is so great a variation in the action of sunlight on colors at different times is generally recognized as making it impossible to define fastness to light in terms of hours of sunlight. It has been proposed (W. D. Bancroft, American Dyestuff Reporter, December 31, 1923) to use an integrating device, such as a photo-electric cell, which will indicate the number of

candle-power hours (or other unit) of light which have acted on the sample, and it has been said that results obtained by this means agree well when light varies in intensity, but lighting is continued until the total light is the same in various cases. In a way, every color exposed to light is an integrating device, which adds, however, not merely the candle-power hours, but all fading agencies acting upon it. This is what is really desired. It is practically certain that in the two exposures at New Brunswick, described above, a photo-electric cell would have shown that the samples exposed in June and July, 1920, received no more light per hour than those exposed in July and August, 1923, yet the former faded over three times as rapidly as the latter. The effect of sunlight varies somewhat with humidity, high humidity encouraging fading. If the writer's memory is not in error, the early summer of 1920 was a season of much higher humidity than midsummer of 1923, which may help to account for the difference in rates of fading.

It has been suggested by W. H. Cady (AMERICAN DYESTUFF REPORTER, vol. 14, p. 87, Feb. 9, 1925) and others that a dye should be used as a standard for measuring fading units of sunlight. Thus the standard dye would be exposed to sunlight along with the samples to be tested and when the exposure had been completed, the number of fading units could be estimated by comparing the standard sample with previously exposed standards or from the number of standard samples which were faded successfully to "a predetermined end point" during the exposure.

This method seems to the writer to be subject to serious objections as a "standard" test. The first and greatest objection is that it demands sunlight for fading. Many people wish to test colors in winter when there is comparatively little effect from the sun and in cloudy weather, or when there is danger from showers. If the exposures are made under glass, to shield from rain, then, as shown above, there is as much variation from the action of the sun as if a carbon arc light were used instead of sunlight. Accordingly, the "standard" color would not assist greatly in drawing conclusions as to the fastness of a color to sunlight with no glass screen.

Another objection to the method is the difficulty of reproducing the standard color accurately. Even when a dyer uses the same dye sample and dyes under what he intends to be identical conditions on two successive days, the resulting dyeings do not always match perfectly. The difficulty would be enhanced by different dyers necessarily using different conditions and samples of dyestuff. The resulting "standards" could not be expected to agree in intensity of color. If they should agree in hue they would be doing well, for it is well known that a dyestuff put out by any manufacturer at different times may differ in hue and also in "strength." It is well known that lighter shades of color show fading more readily than heavier shades, hence differences in standards will cause errors in fading units. This may be corrected for roughly by relations worked out by the writer (Textile Colorist, March, 1921) for the variation of rate of fading with per cent dyestuff used.

The color of the standard sample before and after a unit's fading would need to be specified numerically in order that the same standard and unit should be used in different laboratories. The measurement of these colors entails considerable work, and since the apparatus usually available for the measurements is not very accurate, the use of identical standards in different laboratories would not be guaranteed.

The "fading unit" assumes that a given amount of sunlight would affect two colors to the same relative degree whether the sunlight be intense or feeble. This is not the case. In the writer's previous study of this subject (Textile Colorist, January, 1921) it was found that certain colors are faded twice as fast and others seven or eight times as fast by New Jersey summer sunlight as by Arizona winter sunlight. The relation of rates of fading of different dyes by the two types of sunlight is no more constant than for the carbon arc and either sunlight, hence the value of comparing the fading with that of a standard is not great.

RATE OF FADING IN DIFFERENT POSITIONS

The Uviarc lamp is provided with two horizontal rows of sample holders around it, and each sample holder has three openings, one above another, so that samples are exposed at six different elevations on all sides of the arc. The question naturally arises as to whether the rate of fading is the same at all elevations. To decide this question eight colors were selected and duplicate sets were exposed in different parts of the holders with glass screen. From the fading observed the relative rates in the different positions were estimated. It was found that colors fade more rapidly in the upper holders than in the lower ones. The results obtained were not entirely consistent, but the data given in Column 5, Uv., Table 4, probably indicate relative rates of action well enough for all practical purposes. It is assumed that the rate of fading in the middle opening of the upper holder is unity, and the rate at the middle opening of the lower holder is that given. It is seen that the rate in the lower holder is about eight-tenths of that in the upper holder. While this difference would not be important in deciding whether a color is fast enough for a certain use, it might be of significance if one wished to decide which of two colors is the more fugitive. For that reason it is well to bear in mind that the existence of this difference in rate of action exists in the different positions.

The variation in fading observed at different points of the Uviarc led to a similar investigation of the Fade-

Ometer. Again the color in the upper opening was found to fade the more rapidly so this rate was taken as unity and the relative rate of fading in the lower opening was recorded in Table 4, column 6, "Fade." It is seen that the relations are much the same as in the Uviarc, but that the differences in rate are slightly less. Still these differences should be borne in mind if accurate comparisons of fastness are desired.

Evidently if one wishes to compare accurately the fastness of two colors they should both be exposed in the upper or both in the lower holders of either the Uviarc or Fade-Ometer.

Intermittent vs. Continuous Lighting

The question is sometimes raised as to whether the effect of light on a color for a given number of hours is the same when the lighting is continuous as when it is intermittent. It is usually felt that in the latter case the effect should be less than in the former, the color having a chance to rest up, as it were, between periods of fading. Some colors do indeed recover in the dark. This action is very marked for Carbanthrene Yellow G (No. 56, set N), but most colors do not show it to a noticeable degree. The samples of Set T and the majority of those in Set N were exposed in duplicate in the Uviarc lamp with glass screen. One set of samples were exposed continuously until the desired time of exposure had been attained, while the duplicates were exposed for the same total time, but were occasionally removed from the lamp for a few hours. Both samples of each color were exposed in the same part of the lamp frame so that the difference in effect due to position was eliminated. After the completion of the exposures the samples were compared and the relative effects noted. The results are given in the last column (headed "Int") in both Tables 1 and 2. The rate of action of continuous light was taken as unity and the estimated relative rate of action of intermittent light is given in the tables.

It is seen that it usually makes very little difference whether the lighting is continuous or intermittent, but that sometimes the continuous lighting is slightly the more effective and sometimes the intermittent is considerably more effective than continuous. On an average the intermittent is about one-eighth faster in its effect than continuous.

Temperature of Samples

It is sometimes stated that the changes in colors exposed in fading lamps are caused in part by the high temperatures to which they are subjected. It is hard to say just what the temperature of a sample is at any time, but we may properly assume that the temperature attained by the sample in a fading lamp bears the same relation to its temperature in the sun as the temperature registered by a thermometer in the sample holder of the fading lamp bears to that registered by it in direct sunlight. It is probable that a thermometer in summer sunlight would seldom register higher than 40 deg. Cent. The temperatures found at the sample supports of the testing lamps used in this study are given in Table 5. Temperatures were taken both with the thermometer bulb bare and wrapped in black paper. For the Uviarc and Fade-Ometer, temperatures were taken both at the upper and lower sample holders. The temperatures obtained at different times varied somewhat, but those given in Table 5 may be regarded as about what is to be expected. Of course, the bare bulb temperatures are the ones comparable to temperatures in the sun, for these are regularly taken with the bulb bare. However, it is evident that a sample exposed in one of these lamps is liable to become hotter than if in sunlight. If a metal backing be pressed against the sample, still higher temperatures may be expected. Under these conditions a thermometer showed as high as 85 degrees in the Fade-Ometer.

Whether these high temperatures are really objectionable is not certain. A lower temperature is only of importance if it assists in duplicating the results of the sun, but even with these rather high temperatures ob-

TABLE 4

Dyestuff	1 No Glass	2 Thin Glass	3 Stand. Glass	4 Thick Glass	5 Uv.	6 Fade
Sulphur Brown 4G	1	0.95	0.90	0.95	0.8	1.0
Primuline BN Dev.	1	.90	.9	.80	.8	.85
Diazine Black H	1	.80	.7	.70	.8	.75
Erie Green WT	1	.95	.7	.75	.8	.85
Carbanthrene Green B	1	.85	.7	.65	.7	.80
Sulphur Green T	1	.85	.6	.50	.8	.85
Erie Fast Red FD	1	.60	.9	.55	.7	.75
Sulphur Blue L	1	.75	.6	.45	.8	.85
Average	1	.83	.75	.67	.78	.84

served both the Fade-Ometer and Uviarc (with glass screen) rather closely approximate the effects of sunlight. Further, when a portion of a sample is covered with a black metal sheet it is not affected, though it must be hotter than the adjacent part which is exposed to the light and faded by it. While, of course, it is theoretically possible for a color to be affected by a moderately high temperature only in the light, the fact that most colors are faded in essentially the same manner by the violet carbon arc and sunlight, and that the chief divergence in effects of the two lights is the failure of certain dyes which are fugitive in sunlight to fade in the arc light (W. H. Cady, AMERICAN DYESTUFF REPORTER, vol. 14, 1925, p. 58) indicate that this possibility is seldom if ever met in practice. It is not to be expected that the temperature about the arc lamps should have much effect on colors for few colors, and none of the common textile fibers are normally injured by a temperature of 100 deg. Cent. If this were not so they could not be washed safely in boiling water. Many dyes are not fast to boiling water because some of the coloring matter is washed out, but it is not destroyed. The only way in which a color is faded by light is by destruction of the coloring matter, since it cannot be washed away or evaporated, and as 100 deg. Cent. does not destroy the colors usually used on textiles, we need not give much consideration to the temperature of samples.

TABLE 5

	Bulb Bare		Paper Wrapped Bulb	
	Lower	Upper	Lower	Upper
Uviarc	49° C.	58° C.	56° C.	73° C.
Fade-Ometer ..	41° C.	44° C.	50° C.	56° C.
White Flame...	38° C.		49° C.	

If it is desired to maintain a moderately low temperature about a testing lamp, it can be done without great difficulty by insuring ample ventilation for the lamp. The white flame arc evolves nearly as much heat as the Fade-Ometer and much more than the Uviarc, yet as seen above, by using it without housing and having the samples in a ring around the arc, at a distance of ten inches from it, they were not heated to a higher temperature than might be expected in the summer sun. In the effort to maintain a low temperature it is advantageous to have the samples hung without backing and to have any control resistance that may be in series with the lamp at such a distance that it will not affect the temperature of the samples.

EFFECT OF GLASS ON SUN'S ACTION

It is often desirable to know how much faster one may reasonably expect colors to fade in direct sunlight than when covered by glass, and as shown in Table 3, the average effect of greenish glass of 6/100 to 7/100 inch thickness is to slow up the action about one-third. In order to see whether other kinds and thicknesses of glass have a different effect, four sets of the same eight colors as were used in studying the effect of location in the Fade-Ometer and Uviarc were exposed to sun, (1) with no glass shield, (2) with a cover of colorless glass about 0.033-inch in thickness, (3) with a screen of "standard" glass—greenish glass of 0.06 to 0.07 inch thickness, and (4) with a screen of glass 0.145-inch thick and considerably darker green than the screen of set (3).

The rates of action of the sun on the four sets of colors were compared and the results recorded in Table 4, taking the rate of action on the unscreened sample as unity in each case. The data for the set covered by thin colorless glass is in the column headed "2, Thin Glass," that for the set with "standard" glass in the column headed "3 Stand. Glass," and that for the set covered with thicker glass in the column headed "4 Thick Glass." It is seen that the thin colorless glass reduced the sun's effect on these dyes by about one-sixth, on an average, while the "standard" glass reduced it by about one-fourth and the thicker glass by about one-third. Evidently, the effect of the glass is less in the case of these dyes than for many of the dyes studied, for considering all the dyes studied, the "standard" glass was found to decrease the sun's action by about one-third instead of one-fourth. That there is no more difference in the effects of the thin colorless glass and the green glass, over four times its thickness, may be accounted for by the supposition that much of the ultra-violet light was absorbed by the thin glass, while the thick glass permitted some to pass through, and that not very much visible light was absorbed by either.

INDIGO

A peculiarity in the fading of Indigo, sample 18, series T, is worthy of special mention. Fig. 3 shows a sample of this color which has been exposed in the Uviarc lamp with glass screen for sixty-four hours. This photograph was made from the front of the sample, i. e., the side toward the light. The back of the sample was faded in the same manner but slightly more. The unfaded parts of the sample correspond to the metal grating placed *behind* the sample to hold it against the glass screen. The dark streaks at the sides indicate the position of steel springs which held the grating against the sample. The upper part of the sample, where the number 18 is placed, which was entirely shielded from light was more faded than the part which was in the light but with a metal bar behind it.

To try to find a reason for this peculiarity of Indigo, or at least the conditions which govern it, other samples

were exposed in the Uviarc lamp with glass screen and other conditions varied.

One sample was exposed with a piece of black paper at its back, between it and the metal grid, but with only the glass screen between it and the lamp. This sample was only slightly faded, but the end which was covered

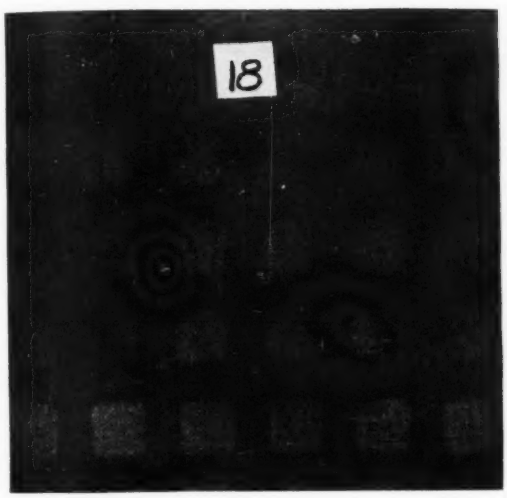

FIG. 3

so it was not exposed to the light, was faded more than the exposed part. The covering was by means of a metal shield which is a part of the lamp shade provided for that purpose.

Another sample was placed in the Uviarc with black paper between the sample and the light, at a distance of one-fourth to one-half inch from the glass screen in front of the sample. The front of this sample was but little faded. More effect was observed on the back of the sample, where the metal grid again exerted a protective influence on the color directly in front of it. In both of these samples the color was badly faded at an opening in the sample holder which was covered with sheet metal and so not exposed to the light.

Several other samples of indigo were exposed, but the results did not give any additional information of importance. The results observed were probably due to the action of traces of ozone which acted on the sample wherever the fabric was exposed to the air. This would readily account for all the phenomena observed. The destruction of indigo by strong oxidizing agents, such as ozone, is, of course, a well known and technically important characteristic of this color. The writer has been informed that various other vat dyes exhibit peculiarities in fading very much as indigo does.

It is to be noted that both the Fade-Ometer and mercury arc showed an abnormally rapid action (as compared to sunlight) on this sample. These were the only arc lights in which the effect of ozone could be expected to appear, since in the others there was no circulation of air behind and in contact with the sample. It appears that it would be well for vat dyes to be exposed in sample holders with cardboard backs which are held tightly against the samples.

THIRTY-SECOND COUNCIL MEETING

The thirty-second Council Meeting of the American Association of Textile Chemists and Colorists was held at the Engineers' Club, Providence, R. I., Friday, June 26, 1925.

The following members were in attendance: L. A. Olney, W. R. Moorhouse, W. M. Scott, W. S. Williams, W. K. Robbins, R. F. Culver, W. C. Durfee, J. F. Bannan and W. E. Hadley.

The following applicants were admitted to membership:

Active Members

Akerstrom, A. R., salesman and demonstrator, National Aniline & Chemical Company, Charlotte, N. C.

Backup, Elliott, chemist, Burlington Mills, Winooski, Vt. 127 Mansfield Avenue, Burlington, Vt.

Blair, James H., superintendent colorist, Aspinook Company. Box 103, Jewett City, Conn.

Braude, Felix, research chemist, Palatine Aniline & Chemical Company. 362 Church Street, Poughkeepsie, N. Y.

Clark, W. J., dyer, Stonewall Cotton Mills. Box 134, Stonewall, Miss.

Constable, Henry B., demonstrator, Du Pont de Nemours & Co. 232 West First Street, Charlotte, N. C.

Cramer, Ralph S., plant manager, Cramer & King Company, Paterson, N. J.

Fuhr, Adolf, foreman dyer, Fairy Silk Mills, Shillington, Pa. 123 New Holland Avenue, Shillington, Pa.

Glenn, H. T., dyer, C. & M. Hosiery Mills, Oxford, N. C.

Hunt, W. M., district manager, Newport Chemical Works, Greensboro, N. C. Box 908, Greensboro, N. C.

Jackson, John E., chemist, 218 Court Avenue, Lyndhurst, N. J.

Jacoby, Morris, chemist, Eastern District Piece Dye Works. 1571 Sterling Place, Brooklyn, N. Y.

Jones, C. A., professor, textile chemistry and dyeing, Georgia Tech., Textile Department, Atlanta, Ga.

Kelly, Wm. J., Jr., chemist, Burkart-Schier Chemical Company, Chattanooga, Tenn.

Mobley, W. R., dyer, Newnan Cotton Mills, Newnan, Pa.

Pickup, Arthur R., dyer and mercerizer, Pickup & Kean, Inc. 115 North Fourth Street, Allentown, Pa.

Purdy, James H., general manager, Southern Worsted Corporation. 102 E. Washington Road, Greenville, S. C.

Smith, Royce G., dyer, Swift Manufacturing Company. 2215 Thomas Avenue, Columbus, Ga.

Watson, George W., salesman, Hazelhurst, Miss.

Weinz, W. E., assistant manufacturer. Grasselli Dyestuff Corporation, 908 Chestnut Street, Philadelphia, Pa.

Junior Members

Jacoby, Evans E., student, Philadelphia Textile School. 812 North Front Street, Sunbury, Pa.

Long, Robert P., dyehouse, Union Bleachery. R. F. D. No. 3, Box No. 1, Greenville, S. C.

Morris, J. W., Jr., salesman and demonstrator. John Campbell & Co., 222 West First Street, Charlotte, N. C.

Provencal, James V., colorist, 113 High Street, Boston, Mass.

Seedge, W. T., dyer, Smith Hosiery Mills. Y. M. C. A., Chattanooga, Tenn.

Stuart, W. Kenneth, assistant colorist, Firth Carpet Company. Box 94, Firthcliffe, N. Y.

Turkington, S. Herbert, dyer, National Silk Dyeing Company, Dundee Lake, N. J. 56 Eighteenth Avenue, Paterson, N. J.

Voight, William R., chemist, S. Slater & Sons. 6 Wall Street, Webster, Mass.

Fred L. Young was transferred from Junior to Active Membership in the association.

It was voted that in the future all applicants for membership should deposit their first year's dues with the application. In case of non-election, this deposit would be returned.

A number of members are still in arrears for their 1924 and 1925 dues, and it was voted that the Proceedings should no longer be sent to them and that they should be dropped from the membership. Those members still in arrears for 1925 will be allowed until August 1st to meet their indebtedness to the Association.

The treasurer was instructed to keep all money collected for the Research Fund, in a separate fund. The treasurer was authorized to collect the subscriptions made by members in response to recent questionnaire.

Respectfully submitted,

W. E. HADLEY, Secretary.

THIRTIETH RESEARCH COMMITTEE MEETING

The thirtieth meeting of the Research Committee was held at the Engineers' Club, Providence, R. I., Friday, June 26, 1925.

The following members were in attendance: L. A. Olney, W. R. Moorhouse, W. M. Scott, W. S. Williams, W. K. Robbins, R. F. Culver, W. C. Durfee, J. F. Bannan, W. H. Cady, W. D. Appel, H. W. Leitch, and W. E. Hadley.

A careful review of the list of American made colors appearing in the 1924 Year Book is under way, in order that the list appearing in the 1925 Year Book may be as complete and accurate as possible. It has been decided that, wherever possible, the Colour Index and Schultz numbers will be included.

American made dyes, which may have been previously manufactured and which appear in the 1924 Year Book will not be published in the forthcoming Year Book if their manufacture has been discontinued.

Mr. Cady, chairman of the Committee on Fastness to Light, reported that investigation of artificial lights and advancements which have been made in measuring the intensity of the sun's rays, is being conducted at the present time.

W. E. HADLEY, Secretary.

Applicants for Membership

Active Membership

Boyd, Louis, M., dyer, Elliott Knitting Mills, Hickory, N. C. Sponsors: W. S. McNab and P. F. O'Neill.

Ruger, George O., textile colorist and demonstrator, Ruger Textile Corporation, Brooklyn, N. Y. Sponsors: F. L. Bume and D. P. Knowland.

Winkler, Alfred, chief chemist, Somerset Aniline Works, Pluckemin, N. J. Sponsors: F. M. Bonnett and H. J. Stulz.

Junior Membership

Marsh, Robert F., chemist, Amoskeag Manufacturing Company, Manchester, N. H. Sponsors: Wm. K. Robbins and Thos. Smith, Jr.

Pennock, Wm. W., colorist, Amoskeag Manufacturing Company, Manchester, N. H. Sponsors: Wm. K. Robbins and W. E. Hadley.

Changes of Address

Alter, F. A., care of A. L. Dean, Canton, Mass.

Ambler, Harry, 205 Acushmet Avenue, New Bedford, Mass.

Baldwin, H. W., 110 Crest Avenue, Beachmont, Mass.

Bloxham, Harold C., 311 West Avenue, Pawtucket, R. I

Bryant, George O., 99 Fairview Avenue, Jersey City, N. J.

Castro, Jesus, 131 North Twenty-first Street, Philadelphia, Pa.

Chase, Harold D., 112 Gregory Avenue, Passaic, N. J.

Lange, Joseph S., Geigy Company, 88 Broad Street, Boston, Mass.

LaSalle, Jos. A., 516 Atlantic Avenue, Boston, Mass.

Marsden, William, 43 Palmer Street, Passaic, N. J.

Schofield, C. Heber, 422 Harmon Road, Roxborough, Philadelphia, Pa.

Tebbetts, J. C., American Aniline Products, Inc., 77 Bedford Street, Boston, Mass.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
Directing Editor

CLAYTON HOAGLAND
Managing Editor

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JUSTICE IN DYESTUFF APPRAISING

IN a recent decision handed down by the U. S. Court of Customs Appeals, involving the appraisement of Crystal Violet Extra, the court found that the imported color was twenty-five per cent stronger than the competing domestic product, Crystal Violet 6B. This percentage was added to the American selling price of the domestic dye to determine the dutiable value of the imported product. The respective uses of the imported and domestic dyes were involved in the case, raising some question as to their competitivity; but the court in this instance rejected the importer's contention that neither the imported nor the domestic dye is commercially used on wool or cotton yarn, but that both are used principally in tinting paper; it found, contrarily, that both products were commercially suitable for wool or cotton yarns and based its final decision regarding the customs duty on that finding.

The importance of this ruling will become more evident as similar decisions are constructed upon it in clearing up future cases involving differences of strength and use of imported and domestic dyestuffs. In the decision it is stated ". . . It should be noted that Congress has provided that the domestic dye shall be considered similar or competitive with the imported dye, if the *imported dye accomplishes results* substantially equal to those accomplished by the *domestic* dye when applied in substantially the same manner. The imported dye is to be compared to the domestic dye, and such comparison may be made without regard to the chief use of either dye."

The decision is significant also because it shows that the Customs Court is not working in the dark; it shows that the court is endeavoring to interpret the tariff law accurately and according to its spirit as well as its letter.

It is impossible for any court to make decisions favorable in every case to both parties. In cases involving dyestuff appraising the importers have in practically every instance lost their appeals from the judgments of the Board of General Appraisers. This, however, does not in any way modify the fact that in every case before the court the evidence was subjected to rigid interpretation under the law, that every endeavor was made to ascertain complete information regarding the colors involved and that no element of favoritism entered into the final decision.

There are those who have always maintained that dyestuff appraisement under the conditions imposed by the present tariff law has never been smooth nor effective. Criticism of this nature should only tend to increase admiration for the excellent work of the Board of General Appraisers and for the justice prevailing in the Customs Court. Theirs is no child's task, particularly when cases involve such highly technical merchandise as dyestuffs, and thus far they have earned the fullest praise of dyestuff manufacturers and importers alike.

CO-OPERATION IN THE SILK INDUSTRY

CLOSER business co-operation of a significant character between two of the most important units in the silk industry will undoubtedly be the outcome of the meeting held last week in the rooms of the Silk Association of America, of a committee of silk dyers, printers and finishers and silk manufacturers. The feature of this meeting was an earnest discussion of rules and principles governing practices between these two great branches of the silk trade. To quote from an account of the meeting, "The lack of established trade custom between printers, dyers and finishers and the manufacturers has made itself felt more keenly to-day . . . because of the tremendous demand for weighted merchandise. This has laid particular emphasis on the question: What is the dyer's responsibilities in regard to the amount of weighting?"

The two representative committees formed at this initial meeting are planning the codification of a definite set of rules to control trade practice of a more or less technical nature. The benefits to the entire silk industry of such co-operation based upon a mutual understanding and observance of authorized trade practices cannot at this early date be fully estimated. That this move toward a clearer conception on the part of both dyer and manufacturer of the responsibilities involved in the processing of silk represents one of the highest forms of commercial co-operation is obvious. Elimination of disputes and complaints, greater efficiency in production, a finer quality of product, resulting in enhanced prestige for the industry—these are only the plainly evident effects of a mutual observance of recognized practices. Not until the plan has withstood the acid test of experience will the industry begin to realize what an important step it made in forging a new link between the manufacturing and processing branches of the silk industry.

Highs and Lows in a Busy Chemist's Life - Part VIII

Financing Research—Mill Tests Involving Chemical Ignorance—A Chlorine Fizz

WHOLE gasometers of phlogiston are evolved regarding research, but it all boils down to a case of the cat chasing its tail. You can't put across the idea of research and get any money to support it until you have some results to show, and you can't show the results until the money has been provided. This is the nearest thing we know to perpetual motion, continual gestures without the expenditures of an energy.

There is more serious thought nowadays than there used to be, and, of course, valuable work is being done. We ourselves, however, have always been up against the problem of trying to get support when we had nothing but arguments as a basis for our requests. The same thing is true when manufacturers' associations are approached by research enthusiasts, even among their own membership.

There is still scant hope when one of the big research spokesmen, president of a well-known textile corporation whose business is largely based upon chemistry, still harbors the idea that the Bureau of Standards is full of scientists that work for the love of working, and therefore the industry really should not need to spend much money—a sentiment expounded scarcely more than a year ago.

Not much advance here from the following in 1922 from a textile engineer. "The cost of research from a practical view is prohibitive if not applied to some object, which if attained will more than return the investment." So far so good. "For this reason it is well to leave to the colleges the investigations in pure science. This very necessary work must be done, and it is only in educational institutions that time is available. Furthermore, men with finest of training in pure research carry out their work for the love of it." This apparently means that we will get it done for nothing if we wait long enough.

Oh, Research! What follies are submitted in thy name!

We shall have to wait until a few textile men appear, who have vision far beyond their contemporaries, and faith to embark upon uncharted seas (seldom encountered outside of literature). A few such prophets in the wilderness may some day arouse a little activity.

Meanwhile we entertain the rather selfish hope that individual firms here and there will be so "up against it" that they will have to turn to research as a way out of trouble and back to success.

But what can be expected if we have not even got our mill friends educated sufficiently to appreciate or understand the nature of simple chemistry? Examples of their ideas of things chemical are still frequently encountered. For instance, a superintendent handed in samples of bleached yarn to be tested for strength, an outside new "chemical" bleach to be compared with our own. Since our own bleach merely uses liquid chlorine, soda ash and oil of vitriol, it evidently has not yet reached the status of "chemical."

The same party wanted some piece-dyed silk tested for fastness and sent along with it a test such as used on certain shirtings. I tried to remonstrate that that was not a suitable test, and that the goods should be tested for the fastness requirements that were particularly necessary. This plea failed to register, so the test was made as specified and the results sent on to the selling house. Since the test was boiling for an hour in soap and soda ash and the color was almost entirely removed, there was some reason in their complaint that this must have been a "chemical" test, and all they wanted was a test for fastness to washing. Finally I made an A. A. T. C. C. test for washing and the result was satisfactory.

"That reminds me," to quote a famous old saying, of another instance where a customer wanted something and apparently neither he nor anybody else knew what. The original specification was for four or five colors to be dyed in the same skein of yarn, and to be fast to bleaching. Obviously the Indanthrene type, assuming that we could dye multicolor effects with these dyes; and we spent a week or more in trying to locate colors for some of the shades. They did not appear to be available; and then all at once we found that the yarn was supposed to be fast to wool bleaching, and further inquiry narrowed it down to stoving. According to all the books, this opened some possibilities in direct colors and after another week of inquiries and experiments, there was still nothing available for use on some of the shades. We had to tell the customer something, and as we did not want the work anyway, we sent a hastily made set of dyeings, some of which we knew would not stand the gaff. Finally Mr. Customer came back with his complaint that "they would not stand cross-dyeing," about which not a word had previously been said, and in this letter he never mentioned bleaching at all.

Chemists also still have many things to learn, and ignorance of some of the simplest of them often makes the most trouble. The makers of liquid chlorine say to set the cylinder in *warm* water if you want the chlorine to come out faster. Some laboratory assistants did so, and got it too hot. Now, as everybody should know, there is a safety plug to meet just such contingencies. I was sitting about twelve yards from the only door, and I do not believe that even Nurmi could do a twelve-yard dash any faster than I did when the chlorine began to fizz. For a time it was quite uncomfortable in the neighborhood of the laboratory, but the principal effect was only the rusting of all exposed iron and steel.

We imagined that the gas attack would play havoc with the cockroaches, but they seemed to be as lively as ever the next day. However, some time after that they all disappeared, but we never knew whether or not it was an aftermath of chlorine treatment. Of another thing, however, we are positively sure: there is a very unfavorable reaction between chlorine and typewriters. Ours promptly stiffened up, and in a few days one could scarcely budge a key.

EARNINGS OF SWISS DYE MANUFACTURERS IN 1924

The combined net earnings of the four firms engaged in the manufacture of aniline dyes in Basle were approximately 10,500,000 francs for the year 1924, according to Consul Calvin H. Hitch, Basle.

The largest of these, Gesellschaft fuer Chemische Industrie, has a capital stock of 20,000,000 francs and total assets of 66,143,553 francs. The net earnings of this firm for 1924 amounted to 3,558,522 francs, which was a decrease from 1923 profits, said to be due to the sharp competition in the Chinese market, particularly with respect to indigo. However, the directors were enabled to declare a 15 per cent dividend after making liberal allowances for the amortization and pension funds.

The financial statement of the Chemische Fabrik vormals Sandoz shows the largest profit of any dye firm in Basle during 1924. The firm is capitalized at 7,500,000 francs, and its net earnings for 1924, 3,360,582 francs, were equivalent to 44 per cent of its capital stock. The board of directors of this firm have declared a dividend of 25 per cent and in addition have recommended to the stockholders the issuance of one bond of 1,000 francs, bearing 5½ per cent interest, for every three shares of stock held. The total assets of this company, according to its annual statement as of December 31, 1924, amounted to 26,284,611 francs.

The firm of J. R. Geigy, S. A., has a capital of 7,500,000 francs and assets of approximately 16,000,000 francs. Although this firm does not publish its statement since it is owned exclusively by the Geigy family, it is known that its earnings for 1924 were very large, amounting to approximately 3,000,000 francs, or about 40 per cent of its capital stock.

The firm of Durand and Huguenin, S. A., has recuperated to a very large extent from the effects of the war, and its net earnings in 1924 were larger than in the preceding year. This firm, which is capitalized at 2,000,000 francs, showed net earnings of 567,809 francs, and declared a dividend of 10 per cent.

The establishment of common sales agencies abroad by the German Dye Cartel is progressing rapidly. It is reported that the I. G. has merged its former sales agencies in Czecho-Slovakia into one, with branches in Prague, Brunn (Brno) and Reichenbach. This maneuver aims to eliminate competition between members of the German Dye Cartel and to reduce overhead costs of maintaining several branches.

At the same time the agency for photographic articles and chemicals has been separated from the main sales agency, and the three representations of the Agfa, Bayer and Hoeschster plants fused into one; the latter will sell the South Slav and Italian markets, as well as Czecho-Slovakia.

NEW TEXTILE SCHOOL AT N. C. STATE COLLEGE

The Board of Trustees of North Carolina State College has created a new textile school and elected Professor Thomas Nelson as dean to head the new division.

In expanding the textile department into a distinct administrative unit, which will rank in importance with the schools of agriculture, engineering, and science and business, the scope of the work in the new school, it is announced, will be greatly enlarged.

Tompkins Hall, the textile building, will be substantially increased in size by additions to the structure to be started at once, new equipment and machinery will be installed, and a research program that will serve both the cotton grower and the manufacturer will be actively pursued, with the close co-operation of the Agricultural Experiment Station, under the direction of James McDowell, an internationally known authority on cotton, as Director of Textile Research.

Among the officers elected to serve the Southern Association for the ensuing year were two graduates of the Textile School of the North Carolina State College. L. R. Gilbert, class of 1907 and superintendent of the Caraleigh Mills, Raleigh, was elected chairman of the Board of Governors, and Carl R. Harris, class of 1917, was elected a member of the board.

At the recent meeting of this association James McDowell delivered an address on "Fundamental Research in Textiles," which has received very favorable comment from cotton manufacturers.

The Government Bureau of Standards has issued circulars giving master specifications for the following classes of textile materials: white cotton rags for wiping machinery; cheese cloth for wiping purposes; cheesecloth, unbleached; brown cotton sheeting; wiping cloths; colored cotton rags for wiping; brown denim; brown wide cotton sheeting, and bleached cotton pillow cases. The circulars cover the grade, material, general and detailed requirements, testing, and other information on each product.

CREDIT NOTE

The Reporter desires to acknowledge a regrettable omission in the article that appeared in the July 13th issue, entitled "Wool-Scouring Waste Liquors—Composition and Disposal," by F. P. Veitch and Leon C. Benedict. Through an oversight no mention was made of the fact that this article was a paper presented before the Providence meeting of the American Institute of Chemical Engineers on June 24th.

Dyestuff Tables

A List of the Principal American-Made Colors with Their Properties and Fastness Characteristics

[NOTE: The publishers of The REPORTER have secured more or less complete data in regard to many of the dyestuffs which are at the present time being manufactured in the United States. As the following material has been brought together from various sources, they realize that errors are quite likely to appear, and it is earnestly requested that any readers who find errors or who are able to give additional information will communicate with the publishers in order that this material may be made as correct, complete and up to date as possible. These tables will appear serially until all colors upon which we have data shall have been covered. The publication of this data was begun in the issue of March 10, 1924.]

PONTACYL VIOLET 6BN

(Schultz No. 548)

COMPOSITION: Triphenylmethane.

SPECIALLY SUITABLE FOR: Wool and wool-silk.

USUAL METHOD OF DYEING: Glauber salt and sulphuric acid.

SHADE: Very bright bluish violet.

SHADE BY CASLIGHT: Best of the acid violets in this respect.

SOLUBILITY: Poor; use a little soda.

LEVEL: Fair; dyes level with care.

EXHAUSTS: Well.

FASTNESS TO:

Acid: Strong acids change the shade toward green, but the shade returns on neutralizing.
Alkali: Soda makes the dyeings greenish.
Cross-Dyeing: Good when resisted.
Fulling: Will stand a very light fulling.
Ironing: Fast.
Light: Moderate except in heavy percentages.
Perspiration: Fast.
Potting: Moderate.
Rubbing: Crocks slightly.
Steaming: Fair; will stand moderate dry steaming.
Street Dirt: Moderate.
Washing: Will stand washing with a neutral soap.
Water: Moderate with very hot water.

SENSITIVE TO METALS, LIME: Sensitive to copper.

OTHER PROPERTIES: Does not tar or bronze as easily as the other acid violets in dissolving.

DYED BY OTHER METHODS: Can be dyed chromate or top chrome. No change except that the shade is slightly greener and duller.

ON UNIONS: Gloria: Both fibers the same shade. Wool is dyed in a neutral bath, but not as heavy as with the other violets S-527 and S-530. Cotton is left nearly white when dyed in cotton-wool unions in a neutral bath.

ON OTHER MATERIALS: Silk: Dyed with boiled-off liquor and sulphuric acid. Fairly fast when after-treated with tannin.

DISCHARGING: Discharges with hydrosulphite, but the discharged places stain again on exposure to the air. Suitable for color discharge with tin.

COMPETING PRODUCTS: Made in the United States by E. I. du Pont de Nemours & Co., under name of Pontacyl Violet 6BN.

VICTORIA BLUE B

(Schultz No. 559)

COMPOSITION: Diphenyl-naphthylmethane.

SPECIALLY SUITABLE FOR: Cotton and wool.

USUAL METHOD OF DYEING: On cotton, on a tannin mordant at 140 deg. Fahr.

SHADE: Pure shade of blue.

SHADE BY GASLIGHT: No change.

SOLUBILITY: A little acetic aids solution.

LEVEL: Requires great care for level results.

EXHAUSTS: Well.

FASTNESS TO (on Cotton):

Acid: Bluer with acetic; greener with sulphuric.
Alkali: Fast.
Cross-Dyeing: Fair, topped with sumac.
Fulling: Fairly fast.
Ironing: Fast.
Light: Moderate.
Rubbing: Poor; crocks badly.
Sulphur: Poor; will not stand stoving.
Washing: Good, topped with tannin.

DYED BY OTHER METHODS: May be dyed direct with alum. Used to top Primuline. With phenol developer gives fast greens.

ON OTHER MATERIALS: On wool: Dyed with Glauber salt and sulphuric acid; fast to acids, washing, ironing, perspiration and street dirt; not fast to light, steaming, alkali or rubbing; fairly fast to fulling, though shade goes grayer. On silk: Dyed with boiled-off liquor and sulphuric acid; poor light fastness; fast to water on silk. On jute: Dyed neutral at 140 deg. Fahr. Paper: Dyes all kinds, sized and unsized, and has great affinity.

PRINTING: On cotton, with acetate of chrome; on silk, with tannin.

DISCHARGING: Chlorate gives white discharge; zinc also. Tin used for color discharges. Suitable for dyeing caustic soda discharged cloth.

COMPETING PRODUCTS: Made in the United States by E. I. du Pont de Nemours & Co., under names of Victoria Blue B Base, Victoria Blue B Conc., Victoria Blue BX and Victoria Blue R; National Aniline & Chemical Company,

under name of Victoria Blue B; Newport Chemical Works, under name of Victoria Blue B; Calco Chemical Company, under name of Victoria Blue B.

ALKALI FAST GREEN 2G
(Schultz No. 564)

COMPOSITION: Diphenyl-naphthylmethane.

SPECIALLY SUITABLE FOR: Wool.

USUAL METHOD OF DYEING: Glauber salt and sulphuric acid.

SHADE: Bright yellowish green.

SHADE BY GASLIGHT: Bluer and brighter.

SOLUBILITY: Excellent.

LEVEL: Dyes level.

EXHAUSTS: Slowly but completely.

FASTNESS TO:
Acid: Fast to acetic; turns yellower with mineral acids.
Alkali: Shade goes lighter.
Carbonizing: The shade returns on rinsing and neutralizing.
Fulling: The direct dyeings as well as the chrome dyeings are almost good against white cotton.
Light: Moderate; same as the acid greens.
Perspiration: Moderate.
Rubbing: Fast.
Steaming: Moderate.
Sulphur: Very good; better than the acid greens.
Washing: Same as the acid greens.

SENSITIVE TO METALS, LIME: Not affected by copper or iron.

DYED BY OTHER METHODS: After-chromed, the shade is slightly yellower and fuller. The fastness to washing is better, also to fulling.

ON UNIONS: Cotton-wool unions: The cotton is left white in an acid bath. Gloria: Both fibers nearly the same shade; silk a trifle light.

ON OTHER MATERIALS: On silk: Boiled-off liquor and acid. Fairly fast to water.

PRINTING: Suitable for printing pieces sour and also slubbing. Also suitable for silk and gloria.

DISCHARGING: The dyeings on wool are not dischargeable with tin, as the discharged place turns blue, but discharges with zinc of hydrosulphite.

COMPETING PRODUCTS: Made in the United States by National Aniline & Chemical Company, under name of Alkali Fast Green 2G.

PONTACYL BLUE R
(Schultz No. 565)

COMPOSITION: Diphenyl-naphthylmethane.

SPECIALLY SUITABLE FOR: Wool.

USUAL METHOD OF DYEING: With Glauber salt and acetic acid.

SHADE: Duller in shade than S-562.

SHADE BY GASLIGHT: Slightly redder.

SOLUBILITY: Moderate.

LEVEL: Poor; dyes level only with great care.

EXHAUSTS: Very quickly.

PENETRATION: Poor.

FASTNESS TO:
Acid: Fair; same as S-562..
Alkali: Moderate.
Carbonizing: Fair.
Fulling: Moderate, dyed direct; top-chromed, somewhat better.
Ironing: Fast.
Light: Moderate; same as S-562.
Rubbing: Poor; crocks.
Steaming: Shade loses depth.
Street Dirt: Moderate.
Sulphur: Shade goes much duller, though better than S-562 in this respect.
Washing: Moderate; top-chromed better.
Water: Moderate.

OTHER PROPERTIES: Not suitable for use in combination shades on account of not being level dyeing.

DYED BY OTHER METHODS: Goes on the wool in a neutral bath.

ON UNIONS: Cotton-effect threads are stained more than with S-562. Gloria: Well adapted, as both fibers are dyed a uniform shade in an acid bath. Silk is greener than the wool.

ON OTHER MATERIALLS: Paper: Suitable for sized pulp. Silk: Dyed with boiled-off liquor and sulphuric acid. Shade not fast to water.

PRINTING: Suitable for wool printing on pieces and slubbing. Also adapted for silk printing (acid). Not adapted for vigoureux on account of poor fastness.

DISCHARGING: On wool the color is discharged with zinc dust. It cannot be discharged with tin crystals.

COMPETING PRODUCTS: Made in the United States by E. I. du Pont de Nemours & Co., under name of Pontacyl Blue R.

WOOL GREEN S
(Schultz No. 566)

COMPOSITION: Diphenyl-naphthylmethane.

SPECIALLY SUITABLE FOR: Wool.

USUAL METHOD OF DYEING: Glauber salt and sulphuric acid.

SHADE: Bluish green.

SHADE BY GASLIGHT: Trifle yellower.

(Continued on page 514)

DYEING ACETATE SILK

(*Continued from page* 484)

as in Method No. 74A, except that *B*-naphthol or other developer is substituted as desired.

Method No. 76: Ionamine L Paste.—This Ionamine is in the form of a paste and is very soluble in water. It has good penetrating properties and may be used alone as a direct yellow, or with the various developers as shown in Table X. It is applied as in Method No. 74, but with only 1 per cent of formic acid, and may be finished or developed as in Method No. 74A. *B*-naphthol developer is prepared as in Method No. 74A, or resorcinol is dissolved in hot water only and used in a bath containing 6 per cent of developer. In any of trese developing baths, if a standing bath is used an addition of about 2 per cent of developer is made after each lot of goods has passed through the bath.

Ionamine MA, which dyes as a direct yellow, may be developed to orange or red shade. Ionamine Red GA gives a yellow-scarlet which may be developed. Ionamine Red KA is only used as a direct color. They are applied from a dye bath containing 2 per cent of formic acid at about 75 to 80 deg. Cent. (167 to 176 deg. Fahr.). When the Ionamines are used with the direct cotton dyes on acetate silk-cotton unions, it is best to apply them from an alkaline or soda ash bath rather than from an acid bath, and most of the Ionamines may be applied in this manner. The Ionamines have also been printed on acetate silk, using the thickened dye solution containing an organic acid. After printing, the material is dried, steamed five minutes and washed. It may then be diazotized and developed if desired. While the shades are good, they do not always have the desired fastness to washing. The following abstracts give some information as to the general methods of manufacture, the products used in and the constitution of the Ionamines.

One of the first patents on the Ionamines appears to be British Patent No. 197,809, April 5, 1922, to A. G. Green, K. H. Saunders and the British Dyestuff Corporation, and covers a process of manufacture. In this patent it states that although compounds having the general formula $X.N_2.Y.NH.CH_2.SO_3H$ are very unstable in alkaline solution, those containing a nitro group in the para-position of the nucleus (X) may be reduced with sodium sulphide to the corresponding

TABLE NO. X—FASTNESS PROPERTIES OF THE IONAMINES

IONAMINE A

	Direct	*B-hydroxynaphthoic Acid*	*B-naphthol*	*Resorcinol*
Shade	Yellow	Black	Reddish-purple	Reddish-brown
Washing	Very good	Very good	.....	.....
Mineral acids	Poor	Very good	.....	.....
Soda	Very good	Good	.....	.....
Perspiration	Very good	Very good	.....	.....
Hot pressing	Very good	Very good	.....	.....
Light	Poor	Fairly good	.....	.....

IONAMINE H

	Direct	*B-naphthol*	*B-hydroxynaphthoic Acid*	*Resorcinol*
Shade	Yellowish-green	Bluish-red	Bluish-violet	Reddish-brown
Washing	Very good	Very good	.....	.....
Mineral acids	Poor	Good	Very poor	.....
Soda	Fair	Fair	Very poor	.....
Perspiration	Very good	Very good	.....	.....
Hot pressing	Good	Good	.....	.....
Light	Good	Poor	.....	.....

IONAMINE L

	Direct	*Resorcinol*	*B-naphthol*	*B-hydroxynaphthoic Acid*
Shade	Dull yellow	Reddish-brown	Bluish-violet	Bright blue
Washing	Very good	Very good	Very good	Very good
Mineral acids	Poor	Good	Very good	Very good
Soda	Poor	Poor	Very good	Fair
Perspiration	Very good	Very good	Very good	Very good
Hot pressing	Very good	Very good	Very good	Very good
Light	Fairly good	Good	Poor	Poor

IONAMINE B

	Direct	*Resorcinol*	*B-naphthol*	*B-hydroxynaphthoic Acid*
Shade	Orange	Orange-brown	Scarlet	Crimson-red

diaminoazo compounds without splitting off the methyl-omega-sulphonic acid radicle.

In the same manner, diazo compounds having the general formula $X.N_2.Y.N_2.Z.NH.CH_2.SO_3H$, in which X contains a para-nitro group, may be reduced to the corresponding diaminodisazo compounds. By subsequent treatment of these diaminoazo compounds with sodium bisulphite formaldehyde, a second methyl-omega-sulphonic radicle may be introduced. For example: When 13.8 parts of *p*-nitraniline are diazotized and coupled with 20.9 parts of sodium methylanilineomega-sulphonate, on neutralizing the resulting 1,300 parts of solution with sodium carbonate and stirring, most of the nitroazo dyestuff will separate as a fine suspension. On adding a cold solution containing 50 parts of sodium sulphide crystals in 200 parts of water and stirring for sixteen hours, complete reduction is effected and the resulting diaminoazo may be salted out, filtered off and used to dye acetate silk from a slightly acid dye bath. It has no affinity for cotton. United States Patent No. 1,483,798, February 12, 1924, covers the same process.

British Patent No. 200,873 (1922), to Green, Saunders and the British Dyestuffs Corporation, is another early patent covering the application of the Ionamines. It specifies methyl-omega-sulphonic acids, derived from amino- or monoalkylamino-azo compounds, dissociated slowly in hot aqueous solutions which are slightly acid or alkaline, and the free (colored) amino- or alklyamino-azo bases thereby liberated are readily absorbed from solutions by the acetate silk. The colored bases absorbed by the acetate silk may be diazotized and developed with suitable phenols, amines or aminophenols, with consequent change of shade. In this manner acetate silk may be dyed many shades except green. Ethyl-omega-sulphonic acid and analogous acids are also mentioned, but they are less stable toward acids and alkalies. In printing, the alkyl-omega-sulphonic acid is applied in a thickened paste containing an organic acid, after which it is dried and steamed. This process is also covered by United States Patent No. 1,483,797, February 12, 1924.

British Patent No. 212,029, January 13, 1923, to Green, Saunders and the British Dyestuffs Corporation, covers the production of acetate silk azo dyes containing dialkyl-omega-sulphonic groups, such as sodium ethylmethylaniline-omega-sulphonate, coupled with diazo compounds from *p*- and *m*-nitroaniline and dinitroaniline to obtain dyes giving red-orange, yellow and bluish-red shades, respectively. These may also be used as acid dyes on animal fibers. For example: 13.8 parts of *m*-nitraniline are diazotized and the solution added to a cold concentrated aqueous solution of 23.7 parts of sodium ethylmethylaniline-omega-sulphonate. Soda ash is added to faint alkalinity, when the dyestuff separates out. This dye readily hydrolyzes in the dye bath and gives a golden-yellow shade on acetate silk from either acid, neutral or alkaline dye baths. United States Patent No. 1,483,798, February 12, 1924, covers the same process.

In British Patent No. 212,030, January 15, 1923, to Green, Saunders and G. H. Frank, it is suggested to couple diazotized *p*-aminobenzeneazoanilinemethyl-omega-sulphonic acid and other diaminoazomethyl-omega-sulphonic acids with *m*-phenylenediamine, the former giving a red shade on acetate silk; or diazotized *p*-aminobenzene-azo-*B*-naphthylaminemethyl-omega-sulphonic acid with aminonaphtholdisulphonic acid (H-acid). Such dyes prepared from these or similar components, if without any sulphonic group attached to the benzene or naphthalene nucleus, may be used to dye acetate silk, while the similar dyes containing such sulphonic groups dye animal fibers. Many azo dyestuffs of the general formulas $P.N{:}N.X.N{:}N.Y.NH.CH_2.SO_3H$ and $P.N{:}N.X.N{:}N.Y.N{:}N.Z.NH.CH_2.SO_3H$, where P is a phenol, carboxyphenol, aminophenol, naphthol, aminonaphthol, dihydroxynaphthalene, or *m*-diamine, or a sulphonic acid thereof, may be prepared by diazotizing diaminoazomethyl-omega-sulphonic acids and coupling the diazo compound so obtained with the above derivatives, the methyl-omega-sulphonate being unaffected.

For example: 37.8 parts of the sodium salt of the dyestuff obtained by combining *p*-nitrophenyldiazonium chloride with methyl-*B*-naphthylamine-omega-sulphonic acid and reducing with sodium sulphide, are diazotized in 2,400 parts of water and the product added to an alkaline solution of 42 parts of 81 per cent aminonaphthol disulphonic acid H. After twelve hours' stirring the solution is neutralized, heated to 45 deg. Cent. (113 deg. Fahr.) and the dye salted out. This product dyes wool a blue shade from an acid bath.

(Part XI will appear in an early issue)

PLAN SECOND CHEMICAL EQUIPMENT SHOW

The board of directors of the Association of Chemical Equipment Manufacturers, following the successful first Chemical Equipment Exposition in Providence June 22 to 27, has instructed that through its proper officers an immediate survey of exposition building, exposition city, available date, etc., etc., data be made, as applicable to a second Chemical Equipment Exposition under the management of the association. Upon the basis of this data a determination of future equipment show activity is to be made within a short time.

The survey is to be based upon the various physical, geographical and time considerations that have been found essential to the organization and conduct of a strictly industrial-and-technical-attendance exposition drawing its interested visitors from all of the producing industries in which chemical processes are involved in any stage.

Technical Notes from Foreign Sources

Mordanting Animal Fibers with Quinone

In French Patent No. 555,521, there is described a process for mordanting animal fibers with the aid of quinone. The fibers are first passed through a 1 per cent solution of quinone, the process being carried out in the cold. When the fibers that have been impregnated in this manner are dyed, very deep shades are obtained, and this is accomplished without changing the color tone or without any preliminary treatment. This results in a considerable saving of coloring matter, as less of the dyestuff will have to be used to obtain a shade of a certain depth when quinone is employed as a mordant than otherwise. At the same time, the fabrics that have been dyed in this manner have shown an increased resistance to mechanical influences. The new mordanting process is very well suited for dyeing with Alizarine and Indigo, as well as with the dyestuffs that are generally after-chromed.

Dyeing with Oxidized Phenols

Animal and vegetable fibers, feathers, furs, hairs, leathers, artificial silks, wood, gelatines, etc., are dyed and printed with the aid of phenols of the benzene series. These materials are treated either on the fiber or in the bath, in the cold or with the application of heat, with nitrites or nitrous acid in the presence of metallic salts or oxides. Amines may be employed in the place of phenols, but at an elevated temperature so as to form the corresponding phenol.

Gaseous nitrous acid may be employed in the place of nitrites, the acid gas being carried in a stream of air, steam, or other gas. In the patent in which this process is explained (see British Patent No. 230,123), the following phenols are employed in the process: phenol, salicylic acid, salicylic aldehyde, sulphosalicylic acid, acetylsalicylic acid, antipyrine salicylate, resorcin, dinitroresorcin, diaminoresorcin and their salts; the use of amines is exemplified by aniline.

When insoluble the metallic compound may be enclosed in a bag in the bath. Two or more salts of double salts may be employed. Examples show the use of the combinations to obtain a variety of yellow, brown, red, green and black tints. In general the bath is composed of a phenol or an amine, a metallic salt, nitrite, and an acid or acid salt, such as bitartrate, but if a phenol-acid be employed the acid may be omitted.

Fixing Aluminum Mordants in Vegetable Fibers

An investigation was made of the degree to which four different basic aluminum sulphate solutions were absorbed by vegetable fibers. These solutions contained respectively per 10 c.c. 0.2868 gram of alumina and 0.4519 gram of sulphur trioxide, 0.2843 gram of alumina and 0.2267 gram of sulphur trioxide, 0.1841 gram of alumina and 0.3603 gram of sulphur trioxide, and 0.1811 gram of alumina and 0.1927 gram of sulphur trioxide. The fiber investigated is known as boiled-out "Mitkal" which is prepared under various conditions with Turkey Red oil and chalk.

The preferential absorption of alumina by untreated "Mitkal" occurs in proportion to the dilution and the ratio alumina to sulphur trioxide of the aluminum sulphate solution, and is favored by pretreatment of the fabric with Turkey Red oil and chalk. The preferential absorption of sulphate was hindered by pretreatment with chalk and by dilution of the mordanting solution. Fabric which has been pretreated with Turkey Red oil absorbs a greater proportion of sulphate ions than untreated fabric, and this difference is more evident with fabrics which have been treated with chalk and when the mordanting solution has a low ratio, alumina to sulphur trioxide. (From Nachr. Textilind. Russia, volume 2, pages 45-9, through Chemische Zentrallblat, 1925, I, 1248.)

Oxidation of Aminoazo Dyestuffs in Printing

Two investigations were made on this subject and reported in the Bulletin Societe Industr. Mulhouse, 1925, pages 45-47.

In the first report deep brown shades, which are especially fast to light and to washing with soap, are obtained by the oxidation of mono-aminoazo and polyaminoazo coloring matters. The process takes place in the presence of a mineral acid. The fabrics themselves are prepared with manganese bistre brown. Similar shades are also produced when the oxidation is effected by means of chromic acid which is employed in the place of manganese bister. Mono-aminoazobenzene and especially Bismarck Brown yield useful shades which may be easily discharged white by means of formaldehyde bisulphite.

In the second report the brown shades which are described above may also be printed and developed by steam methods, which are similar to those commonly employed for Aniline Black. The prepared liquor contains an aminoazo coloring matter, for example, Bismarck Brown, sodium chlorate, ammonium chloride, and vanadium. Formaldehyde bisulphite may also be employed for obtaining colored resists and discharges.

When the aminoazo coloring matter or its hydrochloride, for example, paraminochrysoidine hydrochloride, is soluble in aqueous solutions which contain sodium chlorate; the prepared liquor may be applied to the fabric by padding.

An example of the process is given in the original and is substantially as follows: The problem is to obtain colored resist effects on a brown field by the padding process. The solution employed for padding the fabric contains

20 grams of para-aminochrysoidine hydrochloride per liter, 25 grams of sodium chlorate, and 20 grams of ammonium chloride. The vanadium salt which is usually added in order to aid in the oxidation of the dyestuffs need not be employed in this case, for oxidation takes place readily. The fabric is dried after this treatment which produces the ground and is then printed with a paste which contains 200 grams per liter of Rongalite C, 3300 grams of British gum, 50 grams of anthraquinone in the form of a 30 per cent paste, and a suitable sulphur or basic coloring matter. It is also customary to add zinc oxide whenever that substance is required.

The cloth is then steamed in a small Mather-Platt apparatus for a period of 3 to 4 minutes at a temperature of 150 deg. Cent. and is then soaped at the boiling temperature. It is claimed that the processes thus described produce good results, although pure white discharges have been found difficult to obtain even when drying of the prepared fabrics is accomplished at moderate temperatures. It was also found that para-aminochrysoidine is much less easily oxidized than Bismarck Brown or aniline, but samples of this dye obtained from different sources were not equally susceptible to oxidation with and without the aid of a catalyst. A cerium salt was found suitable for this purpose.

Two-Color Effects on Textiles

The obtaining of two-color effects in textile fabrics is carried out in the simplest manner by using mixtures of various fibers in weaving the cloth. Thus there are obtained half silk, half wool, wool-silk and other fabrics of similar character. The different behavior of these fibers toward the various coloring matters results in the two-colored fabric.

In order to obtain the same effect in the case of a woolen fabric, on the other hand, it is necessary that a part of the wool be dyed in the yarn form or be prepared in such a manner that its affinity for a certain coloring matter is enhanced or diminished. Then when such wool is woven with other woolen fibers similarly treated or with untreated wool, after dyeing a multi-color effect is obtained.

In order to reduce the affinity of the fiber for coloring matter it has been found that treatment with thiosulphate is most effective; on the other hand the affinity of the fiber for dyestuffs is increased by treatment with chlorides. In the original article on this subject, in Zeitschrift fuer Textil-Industrie, 1925, pages 9, 39 and 52, there are given detailed formulae for carrying out the process. This refers particularly to obtaining two-color effects on wool-silk, half wool and half silken fabrics.

In the case of the half woolen fabrics good results are obtained in a particularly simple manner through the use of substantive azo coloring matters which are capable of being diazotized or coupled. These coloring matters do not dye wool on the one hand, and withstand the subsequent dyeing operation carried out with the aid of the acid wool colors.

The conditions are similar with a great many of the coloring matters that belong to the sulphur series, as they likewise possess only a very slight affinity for the wool fiber. In the case of the vat dyestuffs it must be borne in mind that certain of these coloring matters dye wool. However, it is just necessary to choose from among these the ones that will dye wool as little alkali as possible.

Details are also given of the process for obtaining two-color effects on mixed fabrics composed of wool and artificial silk, of natural and artificial silk, as well as of half wool and silk. The processes described depend mainly on the different behavior of various animal and vegetable fibers toward the groups found in the various classes of coloring matters.

Bleaching with Oxygen and Ozone Bleach Liquors

The process patented in German Patent No. 410,106 relates to the bleaching of textile fabrics without cooking, by means of a bleach liquor which contains oxygen or ozone. The apparatus in which the process is carried out includes a means of forcing gas or air under presssure into the bleach liquor. A liquor pump is employed for maintaining the pressure at the proper point.

The advantage of the process lies in its simplicity and the ease with which it is controlled. Furthermore, the bleaching process may be carried out with good results by means of as small as possible a quantity of bleach liquor. Rapid and uniform bleaching results are obtained in this fashion. In the process the bleaching kier, after being filled with the textile fabrics and with the bleach liquor forced into the kier by means of the liquor pump, in order to cause the liquor to pass through the fibrous structure of the fabrics, is subjected to increased pressure through the introduction of compressed air or some other gas under pressure. During the progress of the bleaching operation the fabrics are maintained under the same pressure in the kier by means of the liquor pump which circulates the bleach liquor through the apparatus.

A pressure tank is connected with the bleaching kier in connection with a compresssor accurately regulated. The pressure tank is also furnished with a liquid level gauge which shows the volume of the bleach liquor and serves also as a control over the operations.

Permanent Crepe Effects on Fabrics

Permanent crepe effects may be obtained on textile fabrics which consist wholly or in part of cellulose acetate or other ester of cellulose or cellulose ether by using the yarn which, after receiving a protective coating, has been given a high twist. The protective coating is given the yarn by impregnating it with the waste liquor recovered from the degumming of silk or with aqueous solutions of gums, starches, gelatin, and the like. The high twist referred to above is, for example, 44 to 86 turns per inch. This is accomplished with or without first drying the yarn.

The twisted yarn is subsequently treated, preferably when in fabric form, for the purpose of removing the coating medium to any desired extent. This may be

effected, for example, by hot water or soap solution; this operation may conveniently serve as the wetting treatment which is required for the development of the crepe effect. In some cases the fabric may be treated, before or after removal of the protective coating, with reagents capable of swelling threads which are made from esters or ethers of cellulose, such as a 5 to 15 per cent solution of acetic acid, or ammonium thiocyanate. For further details see British Patent No. 226,256.

DYESTUFF TABLES

(*Continued from page* 509)

SOLUBILITY: Very good.

LEVEL: Excellent; can be used for shading at the boil.

EXHAUSTS: Not completely.

FASTNESS TO:

Acid: Sulphuric 1-10 turns shade a trifle yellower. Acetic turns shade greener. Muriatic turns it light orange.
Alkali: Bluer with ammonia.
Fulling: Shade goes much bluer.
Ironing: Turns toward purple on the press.
Light: Moderate; used on ladies' dress goods.
Perspiration: Fast.
Potting: Moderate.
Rubbing: Fast.
Steaming: Fast.
Street Dirt: Fast.
Sulphur: Fast.
Washing: Shade goes bluer.
Water: Good.

SENSITIVE TO METALS, LIME: Suitable for shading top-chrome colors after adding to the chrome. Dyed with 20 per cent acetic and top-chromed in a fresh bath with a little acetic, the shade is bluer and the silk is only slightly stained.

OTHER PROPERTIES: Largely used for pieces, especially in ladies' dress goods.

DYED BY OTHER METHODS: Dyed neutral or with acetic acid, does not exhaust well. Dyed chrome mordant, faster to washing and fulling.

ON UNIONS: Cotton-wool unions: Dyed acid, the cotton remains white. Dyed neutral, the wool is only slightly colored.

ON OTHER MATERIALS: Gloria: The wool is dyed deeper than the silk; silk about one-third as dark as the wool. Silk: Boiled-off liquor and acetic; not fast to water or washing. Paper: Add to unsized pulp; suitable for all sized papers; stands alkali.

PRINTING: Suitable for direct wool printing.

DISCHARGING: Discharges cream shade with zinc. Does not discharge with tin.

COMPETING PRODUCTS: Made in the United States by Commonwealth Color & Chemical Company, under name of Comacid Wool Green B; E. I. du Pont de Nemours & Co., under names of Wool Green S, SN and SON; Garfield Aniline Works (Selling Agents, U. S. Color & Chemical Company), under names of Wool Green 2BSM and Wool Green SGR; Grasselli Dyestuff Corporation, under name of Wool Green BSNA; Calco Chemical Company, under name of Wool Green S; National Aniline & Chemical Company, under name of Wool Green S; Newport Chemical Works, Inc., under name of Wool Green SAN.

RHODAMINE B

(Schultz No. 573)

COMPOSITION: Xanthone.

SPECIALLY SUITABLE FOR: Wool and silk.

USUAL METHOD OF DYEING: Glauber salt and a little sulphuric or acetic acid.

SHADE: Very bright bluish pink.

SHADE BY GASLIGHT: No change.

SOLUBILITY: Good.

LEVEL: As a self-color.

FASTNESS TO:

Acid: Good.
Alkali: Good.
Carbonizing: Fast.
Chlorine: Fair; goes lgihter.
Fulling: Fair; stains whites. Top-chromed, fast against white cotton and white wool.
Light: Better than Eosine.
Perspiration: Fast.
Steaming: Fast.
Street Dirt: Fast.
Sulphur: Fast.
Washing: Fairly good direct; much better top-chromed.

DYED BY OTHER METHODS: Suitable for shading top-chrome colors, after chroming. Dyes wool in a neutral bath.

ON UNIONS: Cotton-wool unions: Dyed acid, the cotton is stained considerably. Gloria: Both fibers about equal.

ON OTHER MATERIALS: Silk: With boiled-off liquor, neutral; largely used in the dyeing of silk underwear; light fastness poor; fast to perspiration. Cotton: On tannin mordant, also on Turkey Red oil mordant; fast to washing. Jute: Neutral at 140 deg. Fahr. Typewriter ribbons: Suitable; copies well. Paper: Used for tinting, also for pinks with orange; backwater nearly clear; faster to light than the Saffranines.

PRINTING: On cotton, good with acetate of chrome; wool, suitable; silk, suitable.

DISCHARGING: Glucose soda-lye discharges white. Gives color discharge with tin.

COMPETING PRODUCTS: Made in the United States by E. I. du Pont de Nemours & Co., under names of Rhodamine B Base, Rhodamine B Extra and Rhodamine B; National Aniline & Chemical Company, under name of Rhodamine B; Newport Chemical Works, Inc., under names of Rhodamine B and Rhodamine B Extra.

COAL-TAR DYES IMPORTED DURING JUNE

IMPORTS of coal-tar dyes during June through the port of New York totaled 356,676 pounds, with an invoice value of $315,780; through the port of Boston, 12,089 pounds, with a value of $10,200, and through the port of Philadelphia, 7,903 pounds, with a value of $7,674. The following table gives the comparative figures for imports for each month of this year and 1924:

1925—	Pounds	Invoice Value
January	403,984	$359,376
February	373,259	365,268
March	527,964	488,501
April	451,005	426,141
May	370,271	347,904
June	376,668	333,654
Total, six months	2,503,151	$2,320,844

1924—	Pounds	Invoice Value
January	283,643	$237,868
February	161,869	180,570
March	302,799	307,247
April	176,550	183,789
May	183,079	177,553
June	153,019	156,857
Total, six months	1,215,959	$1,243,884

Per Cent by Country of Shipment

	1925				
	June	May	April	March	Feb.
Germany	50	50	46	49	54
Switzerland	32	32	34	39	27
Italy	5	4	6	5	6
Canada	2	3	2	2	3
England	4	6	6	2	5
Belgium	3	2	3	2	3
France	3	2	2	1	1
Holland	1	1	1	..	1

Dyes Remaining in Bonded Customs Warehouse

	Coal-Tar Dyes and Colors (pounds)	Coal-Tar Intermediates (pounds)
August 31, 1924	507,338	1,081,287
September 30, 1924	559,661	1,111,656
October 31, 1924	552,556	1,050,037
November 30, 1924	553,760	1,031,460
December 31, 1924	575,051	1,086,108
January 31, 1925	571,371	952,202
February 28, 1925	566,038	961,406
March 31, 1925	653,020	1,050,539
April 30, 1925	668,365	1,048,334
May 31, 1925	734,705	1,087,745

Five Leading Dyes, by Quantity, Imported During June

	Pounds
Ciba Violet B, R (single strength)	37,472
Indanthrene Golden Orange (s. s.)	19,284
Cross-Dye Green B	9,005
Ciba Scarlet G (s. s.)	8,930
Rhodamine B Extra (s. s.)	8,600

Imports of Color Lakes

	Pounds	Invoice Value
January	385	$728
February	2,112	1,926
March	5,422	2,061
April	15,660	6,167
May	1,600	1,079
June	3,014	1,511

The imports of bacteriological stains for the first six months of 1925 totaled 48,982 grams, with an invoice value of $3,039. The imports of reagents and chemicals totaled 5,880 grams, with an invoice value of $573.

Of the total quantity of the bacteriological stains imported, 95 per cent came from Germany and 5 per cent from England. Of the total quantity of reagents and chemicals imported for the six months, 99 per cent came from Germany and 1 per cent from England.

FOUR NEW NEWPORT INSERTS

The Newport Chemical Works has recently announced the production of four new colors—Newport Chromotrope 2R, Newport Acid Violet 6R, Newport Direct Green 2Y and Newport Direct Steel Blue G Conc. Inserts for the Newport binder have been issued showing these new productions on swatch pieces and bows, and giving complete information regarding the application, notable properties and fastness properties of each color.

Dyed by the after-chromed method, Newport Chromotrope 2R is particularly suited for the production of navies on worsted materials containing silk or artificial silk effect threads, usually in combination with other colors of the same character which leave the effects white. When so dyed its fastness to light, steaming and sulphur bleach is described as very good, and it is also claimed to have good fastness to fulling, perspiration and cross-dyeing. Through hot pressing it becomes slightly weaker.

Newport Acid Violet 6R is said to be distinguished by excellent level dyeing properties, very good fastness to light, washing, salt water, rubbing, steaming and sulphur bleach; of particular value for dyeing yarns for bathing suits, sweaters and ladies' dress goods.

Newport Direct Green 2Y is described as distinguished by its bright yellowish shade and its good

fastness to light. Of value for dyeing cotton, silk, satins and rayon. Celanese and Lustron are only slightly stained. Fabrics made with combinations of cotton and rayon are uniformly dyed from cold baths. When dyed hot the rayon is dyed heavier.

Newport Direct Steel Blue G Conc. is said to be chiefly of interest for producing cheap greenish-blue shades and as a shading color. It is level dyeing, exhausts slowly, maintaining its shade well, and is well suited for use in jig and continuous machines. It dyes animal fibers somewhat duller and greener, but it is a good base for wool and cotton unions where a dull greenish blue is desired.

DU PONT ANNOUNCES NEW BLACK

The dyestuffs department of E. I. du Pont de Nemours & Co. has just placed on the market a new direct dye known as Pontamine Fast Black LND which, it is claimed, surpasses any product of a similar chemical nature so far offered in both brightness and dischargeability, and even dyeing on unions. The announcement states that it dyes the cotton and silk (or wool) in unions to the same shade, and when dyed on cotton can be easily discharged to pure white with Sulfoxite C.

It is recommended especially for use on half-silk hosiery where its good fastness to washing, perspiration and scrooping are also required, and for any shades from pearl-gray to black on cotton or rayon that are to have discharge patterns produced upon them.

Pontamine Fast Black LND may be after-treated by any of the usual methods without changing shade to any great extent, and the after-treatment with bluestone will increase somewhat the fastness to washing and light.

PROFESSIONAL CHEMISTS WILL STANDARDIZE EDUCATION

Prof. M. L. Crossley, president of the American Institute of Chemists, recently announced the personnel of several important committees of that organization A committee on professional education has been appointed to study the problems connected with the training of chemists and to suggest some standardized course of study that will qualify the graduate as a truly professional chemist. By supplying such carefully trained chemists to the chemical industry it is expected that much of the inefficiency, due to misfits and poorly trained men calling themselves chemists will be eliminated. This committee is headed by Prof. James Kendall of Columbia University and numbers among its members many of the leaders in chemical education.

The problems that arise in connection with the employment of chemists are the particular charge of a committee headed by L. R. Seidell, of New York. A committee that will consider plans for the establishment of an employment service by means of which the employer may be certain of obtaining the proper chemist for his particular work, and by which the chemist may have notice of suitable openings, is in charge of Dr. H. S. Neiman, editor of The Textile Colorist, New York. Strict scrutiny of the qualifications of applicants for membership is the function of the committee headed by Prof. H. G. Byers of New York. The organization of the junior membership is in charge of Prof. A. E. Hill of New York University. The country has been divided into districts, each under the charge of a local committee for this purpose.

MORE ABOUT COLORS

The Atlas Electric Devices Company has issued a twenty-page bulletin, entitled "More About Colors—Fast or Fugitive?" The material in this bulletin was compiled to show the value of the Fade-Ometer to industries making or using colored materials. The bulletin presents its facts and scientific data in the style of a technical article on standard light fastness. In addition to describing the construction and uses of the various types of Fade-Ometers in detail, various phases of the subject of light fastness in general are discussed in a highly interesting manner. The text is supplemented by testimonial letters and extracts from articles on light fastness that have appeared in The Reporter and other technical publications. The bulletin is well illustrated with charts and photographs. It will be sent to those interested on request to the Atlas Electric Devices Company, 364 West Superior Street, Chicago, Ill.

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COLOUR INDEX

in the English Language

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